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JULY 1984 £1

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Electron upgrade

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\*Accents

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\*Block

Small capitals.

\*Data

Like the bottoms of cheques.

\*Greek

It's all Greek to me too!

\*Joined

Standard capitals with joined up lower case

\*Maths

A mix of until now unobtainable Mathematical symbols

\*Miscellaneous

A few oddities which often

are very necessary.

\*Thick

Thick text (for MODEs 0&3) to enhance 80 column mode.

\*Thin

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- ★ NSTICK turn off the STARSTICK ROM
- ★ SETSTICK set up joystick to users spec
- ★ SAVE "NAME" 140 160 saves your user key protocols
- ★ ADVAL emulate standard analogue joysticks
- ★ PAUSE define key to Freeze game
- ★ NPAUSE turn off ability to freeze game
- ★ "NAME" predefined key protocols set up for software houses programs
- ★ HELP KEYS displays currently selected key protocols
- ★ REPEAT enables auto-repeat fire
- ★ NREPEAT disables auto-repeat fire

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Large picture shows BBC Computer System and a Quickshot II Joystick. Small inset just a few of the joysticks that will work with the patch lead. Screenshot by kind permission of SUPERIOR SOFTWARE





2

July 1984

No 24

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THE ONE AND ONLY BBC, ELECTRON AND ATOM MAGAZINE

**Beginners****Hints & Tips**

51

Readers' enquiries answered in detail. Martin Phillips gets to grips with tape loading, testing the keyboard, text windows and machine code problems

**First Byte**

60

How to set about using your new computer. Tessie Revivis goes beyond the manual.

**PLUS:** Converting listings. Tessie explains the differences between BBC and Electron, and shows how to cope with them

**Letters**

65

Your views, gripes and comments in print on statistics, error codes and the Data Protection Bill

**Dear Kitty . . .**

69

The computer world's first true Agony Auntie answers the sort of questions which might seem simple to some, but confuse many

**Business****Z80 low-down**

99

The software bundle that comes with Acorn's second processor promises much. John Vaux finds out whether it lives up to the hype

**Database ROM**

103

StarBase from GCC controls searching and sorting of information held on disc. Ian Rowlings reports

**Education****Viewdata in action**

108

Tecmedia's EdFax sets up colour viewdata pages. Geoff Nairn reports on its use

**Yellow listing pages**

An extra 16 page section devoted solely to the major listings in this issue

**Program of the month**

*Print your own function key strips with Andrew Britton*

**Hints and Tips**

ii

**Joe's Jottings**

iii

**Inspect utility**

vi

*Martin Clayden helps you examine a Basic program held on disc*

**Beeb Forum**

vii

**How it works**

ix

**IEEE interface programs**

xi

**Utilities for printers**

xiii

**Sound effects**

xvi

*Five readers earn some cash for their astounding noises*

**Teaching facts**

111

Several software projects are on the way to help teach children about information and how to use it. Jean Beck presents a round-up

**Atom****Converting Basics**

121

Barry Pickles presents the concluding part of his explanation of BBC and Atom Basic and how to convert a program from one to the other

**Atom Forum**

123

Barry Pickles presents a lively Atomic mix

**Reviews**

18

**Electron Plus-1**

Acorn's add-on box means printers and joysticks can be connected, and ROM cartridges used. Bruce Smith tries it out

**Solidisk 128k RAM**

153

A memory board with the capabilities of a disc drive. Malcolm Banthorpe sets out its special capabilities

**IEEE trio**

155

Paul Beverley compares three versions of the IEEE interface for the BBC micro from Aries, Acorn and CST-Procyon

**Printers**

161

George Hill on Canon's colour ink-jet printer, plus Barry Pickles on the Brother EP44

**Utilities**

137

The ADE ROM gets a thorough going-over by Vincent Fojut

**TOP OF THE LIST**

<b>Books</b>	<b>141</b>
Five books opened up by Vincent Fojut, Barry Pickles and Jeremy Bennett	
<b>Games &amp; adventures</b>	<b>147</b>
Alligata's Bridge, Level 9's <i>Lords of Time</i> , Program Power's <i>Jet-Power Jack</i> , <i>Daredevil Denis</i> and <i>Demolator</i> from Visions, and <i>3D Tank</i> from Dynabyte	
<b>Regulars</b>	
<b>The News</b>	<b>7</b>
16032 developments, Torch progress, BBC games for Electron, Communications '84, chip camera, Acorn User Exhibition, educational software and CP/M programs	
<b>Joe's Jottings</b>	<b>32</b>
The nitty gritty of communications is Joe Telford's subject	
<b>Beeb Forum</b>	<b>75</b>
Experts unite to bring you the best in techniques and ideas for the Electron and BBC. Bruce Smith is at the helm this month on the subject of BBC Basic	
<b>How it works II</b>	<b>81</b>
Slow your micro down to see exactly how it works. Paul Beverley keeps the machine so busy it can barely cope	
<b>Competition</b>	<b>94</b>
Software worth £1,000 on offer this month	
<b>Top 20 software</b>	<b>145</b>
What's up, down and around, plus Soft Options, giving a round-up of the program scene	
<b>Readers' free ads</b>	<b>181</b>
<b>Small ads</b>	<b>183</b>
<b>Acorn Abuser's Diary</b>	<b>184</b>
Last, but not least, the wicked, sensational, and downright naughty goings-on in the world	

## FRAYED FINGERS? FRAYED TEMPER?

Save yourself the bother with the Acorn User cassette of all the listings in this issue! See page 177 for order form.

## IN THIS ISSUE...

### Communications

#### I The future

27

An overview of developments and where they could lead

#### II On the move

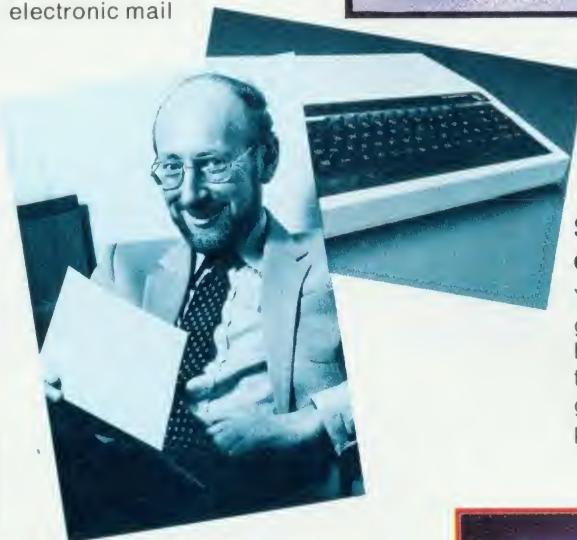
28

How the BBC uses portable micros to send stories back to HQ for wordprocessing

#### III The nitty gritty

32

Joe Telford's Jottings explain the theory and practice of modems and electronic mail



### Second birthday competition

94

Yes, Acorn User has been going for two years! Simon Dally presents an easier than usual quiz with 100 games and sweatshirts as prizes



### Edfax

108

Set up your own viewdata system and generate pictures to be saved on disc with this utility from Tecmedia. Geoff Nairn lets you know what he thinks of it

## NEXT MONTH...

### Downloading the weather

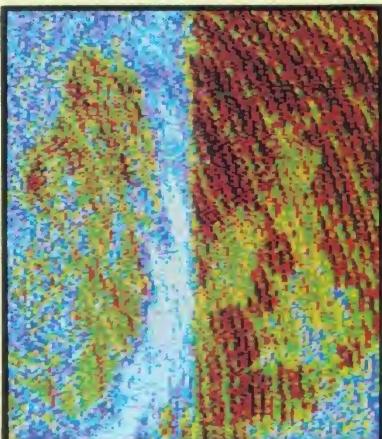
Satellite pictures of Europe on a BBC micro! Robin Mudge reports on how it's done

### Keeping the kids busy

Joe Telford presents his ideas on occupying the little ones during the summer

### Hints, tips and first bytes

Correcting listings, adding a second disc drive, Wordwise aids, coloured listings, using the keyboards... all this and much more





## The Graduate.

The first IBM P.C.  
compatible upgrade  
for the BBC model B micro.

# For an amazing mail order price of £599 (ex. VAT) the Graduate will upgrade the BBC Model B to a powerful 16-bit business computer

Fully disk and hardware compatible with the IBM P.C., the Graduate's MS™-DOS operating system allows exploration of the massive range of IBM compatible business software, programming aids, compilers and languages universally available from all major software houses.

With a simple command stroke, the system can revert to Acorn's own operating system, thereby allowing programmes in BBC Basic to be stored on disk, using the Graduate's own disk controller.

## Introduction to MS™-DOS

The Graduate offers two levels of upgrade, the G400 and the G800, both with 128K user memory as standard. This can be expanded up to 256K on board, or to 1.2 Mbytes with an IBM compatible expansion board. The G400, which is available only through mail order, contains a single, double sided 400K BASF

### TECHNICAL SPECIFICATION

- 8088 16-bit processor running at 5 MHz
- 128K RAM (Expandable to 256K)
- MS™-DOS operating system customised to IBM compatibility
- Model G400 - Single, double sided, high density BASF disk drives (400K unformatted)
- Model G800 - Twin, double sided, high density BASF disk drives (800K unformatted)
- Integral stabilised power supply
- 2 IBM P.C. compatible hardware expansion buses
- Colour Software provided (not G400)  
Perfect 2 Writer/Speller (Word Processing)  
Perfect 2 Calc (Spread-Sheet)  
Perfect 2 Filer (Database)
- Disc interface is not required  
Keyboard text and graphics supplied by BBC Model B

disk drive and provides the perfect introduction to MS™-DOS for the user who wants real power from his Model B.

### Strong combination of Hardware and Software

A step up from the G400 is the G800 which offers twin, double sided 400K disk drives for extra data storage, together with the Perfect 2 Software suite

of business programmes (colour version) comprising Word Processing, Spread-Sheet and Database. This strong combination of hardware and software upgrades your BBC Model B to a versatile business management aid, with the option of even further upgrading for networking, modems, etc., via the IBM compatible hardware slots provided by the Graduate models. Both models come complete with a well written user/technical manual, connecting leads and a mail order catalogue featuring ancillaries and peripherals.

### Just plug it in

The compact and tidy Graduate models simply plug in to the 1MHz bus on the Model B. Within minutes you can be up and running with a fully IBM compatible system that really means business.

To be first with the Graduate, or for further information complete the coupon today.



## **The Graduate.** In a class of its own

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# THIS IS THE BIG ONE!

# The 2nd Official Acorn User Exhibition

**OLYMPIA AUGUST 1984**

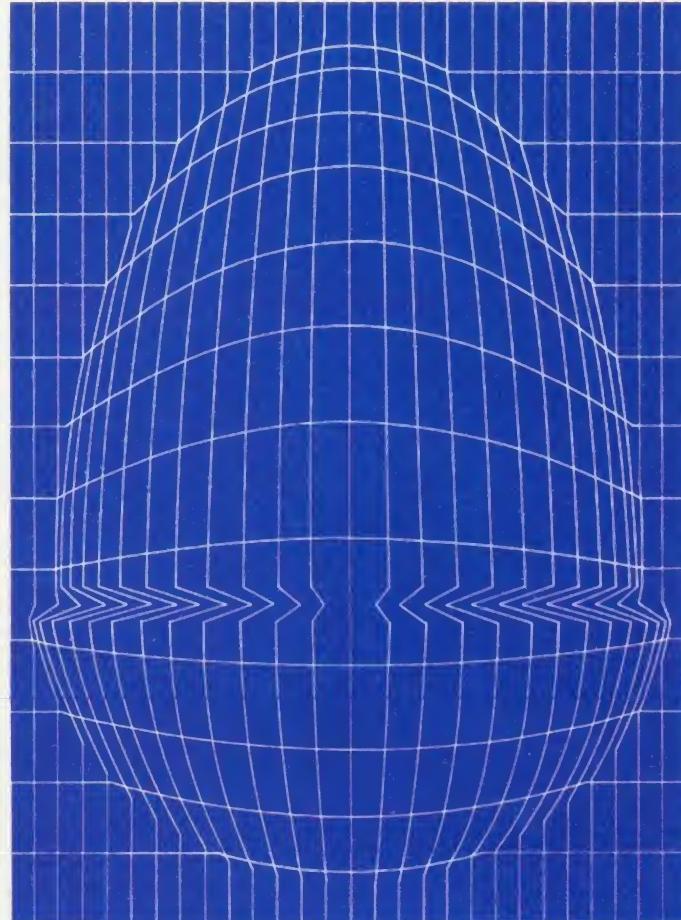
Thursday 16th - 10am to 7pm

Friday 17th - 10am to 6pm

Saturday 18th - 10am to 6pm

Sunday 19th - 10am to 5pm

\* Please note 10am to 2pm on Thursday 16th  
is Trade Morning - By invitation only.



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## BIG VALUE

The success story of Acorn Computers, the BBC Micro and Electron is mirrored by suppliers who have produced more and more hardware, software, supplies and services. And they'll all be at the exhibition - disk drives, plotters, printers, monitors, joysticks, robots, books and magazines, all kinds of software - everything for the Acorn owner.

And of course Acorn will be there in force with all their latest developments and software.

There'll be special offers, competitions, advice centres and special events as well.

And all this for only £3.00 at the door, under sixteens £2.00. (Use the coupon to beat the queues and save £1.00).

## BIG VENUE

Olympia 2 is the brand new exhibition centre next to the old Olympia. It's got everything, wide gangways, lots of space to sit down and rest, plenty of catering areas.

Getting there is easy too, it's got its own tube station, bus routes 9, 27, 28, 33, 49, 73 and 91 go right pass the door, and there's car parking too!

## BIG SUPPORT

Remember this is the *Official Acorn User Show*, it's the most informative prestigious and influential user show in the country. Whether you're a businessman, serious user or games enthusiast there's something for you.

For details of exhibition stands and advance ticket sales contact the organisers.

Computer Marketplace (Exhibitions) Ltd. A Rushworth Dales Group Company, 20 Orange Street, London.  
WC2H 7ED Tel: 01-930 1612

## BEAT THE QUEUES! SAVE MONEY! ORDER YOUR TICKET IN ADVANCE.

Buy your ticket now and save queing. There will be special entrances for advance ticket holders.

Please send me \_\_\_\_\_ (qty) tickets at £2.00 and \_\_\_\_\_ (qty) under sixteen tickets at £1.00. I enclose my cheque/PO  
to the value of £\_\_\_\_\_ or debit my Access card. No. \_\_\_\_\_

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**GROUPS** - Order 15 or more tickets and you qualify for a further 20% discount.

To: Computer Marketplace (Exhibitions) Ltd. A Rushworth Dales Company, 20 Orange Street, London WC2H 7ED.



THE ITV computer series *Me & My Micro*, which aims to teach Basic programming on a Sunday morning, has made copies of the listings featured in the series available to viewers.

The programmes feature the Electron, and so all the software should run on the BBC micro. Comments on the routines are included, and 'souped-up' versions of the games.

To receive the support material, send an s.a.e. to: *Me & My Micro*, Admail 1, Leeds LS3 1YS.

## Medical package is fit for Beeb

A BBC micro-based system has been developed for GPs by Abies Infomatics.

The Abies package uses a 6809 second processor with 64k RAM to store patients' records and is supplied complete with software.

Abies software has been available for mainframe computers for several years, and with the help of Cambridge Microcomputer Systems Abies has adapted the software to run on the Beeb.

Further details: 01-994 6477.

# Acorn dispels superchip doubt

THE 16032 second processor from Acorn looks unlikely to appear before the end of the year, but the project is definitely going ahead.

Rumours in Cambridge earlier this year suggested that Acorn might drop the 32-bit 'superchip' which is the final part of the BBC system.

Speculation was enhanced by stories in the computer press that National Semiconductor, which makes the chips, was having trouble getting them to run at 10MHz, the speed Acorn was reported to want.

However, a high-ranking source within Acorn has denied the rumours and said: 'We are definitely in a go state on this product.' He would not elaborate, or give any details on the timing, price or specification of the system.

Prototypes have been housed in the standard second processor box with  $\frac{1}{4}$ Mbyte of memory provided by 64k RAMs. This is the minimum memory required to run the operating system Unix (or Xenix, as the micro version is called), but the memory size could be increased by using

the latest 256k memory chips.

A spokesman for National said the 16032 chips were available running at 8MHz, but that it would take time to get them up to 10MHz. 'We have customers doing things with 8MHz chips. It depends what Acorn wants to do.'

It has taken about five months to increase the chip speed from 6 to 8MHz, but the company could not give a precise date for the 10MHz version. 'It could be two, three or five months. It could be earlier, it could be later.'

The 16032 actually consists of five chips, two of which are giving the problems.

Once Acorn has decided to accept the chip set, Logica is confident there will be no delay in implementing Xenix.

● As this issue went to press it was announced that the 16032 has been rechristened as the 32016 by National.

## TV fame for school winners

A SPECIAL one-hour micro show will go out live from BBC TV on Sunday June 24 to announce the results of the BBC's schools competition – and it will herald the start of a new magazine programme.

The live show follows the success of the first *Micro Live Special*, which brought in an audience of a million people

on a Sunday morning. All 15 regional winners of the competition will be in the studio, with the final results made in the traditional 3,2,1 style.

The new magazine series will be monthly and will start in October. Some of it will be recorded, and some will go out live, depending on studio demand.

# BBCSoft's Electron push

BBCSoft will produce Electron versions of its games starting in the autumn – and make software spin-offs from educational TV and radio programmes available to the trade.

Software manager David Atherton explained: 'We are going to do versions for the Electron, starting with *White Knight 11* in the autumn.'

'From then on, everything will go to the Electron, apart from disc-only programs, or those which just won't run.'

'Waves' will be the first in a series of 10 packages from *Science Topics*, all going to the trade.'

Four releases set for September are: *Gamescore*,



Fred Harris  
on BBC  
and ITV

which provides routines for building your own strategy board games; *Drawstick*, a graphics painting program; *Wordmover*, a simple text editor aimed at education; and *Astronomy*, a set of graphics demonstrations on the moon, eclipses and planetary motion,

and a moon lander-type game.

The fifth is *Using Your Computer* – a spin-off from schools radio broadcasting. It is aimed to give children aged 8–11 an introduction to micros. At £29.95 it sounds expensive, but includes a book, audio tapes and 12 programs on cassette. Fred Harris, currently fronting Yorkshire TV's *Me and My Micro* series, did the voice recordings and put the package together.

Nearer Christmas, the packs from the *Science Topics* TV series will appear. First will be *Waves*, featuring physics experiments based on ripple tanks, followed by other software, which will be available only on disc.

## Meet authors at the Acorn User Show

ACORN USER authors will be holding a special clinic to help readers with their problems at this year's Acorn User Exhibition in August.

Other special attractions will be displays on education and robotics, with the MEP (Microelectronics Education Programme) showing a touch-screen add-on for the BBC micro.

This year's exhibition will be held in Olympia. It opens with a trade-only day on August 16, through till Sunday August 19.

Several companies will be exhibiting in what Tim Collins, the organiser, has tentatively named 'Robot Road', showing what to interface to your micro.

Information from Tim Collins at Computer Marketplace, 20 Orange Street, London WC2H 7ED.

# 25 BBC MICROS TO BE WON!



## WALL'S ICE CREAM AND ACORN COMPUTER INVITE SCHOOLS TO DEVISE A COMPUTER GAME

Here's a great chance to win one of 25 BBC Microcomputers (B) for your school.

To celebrate the launch of the new MegaBytes lolly, Wall's and Acorn are offering these superb micros free to winners of this 'Mega' competition.

The competition is open to all UK primary, secondary and special schools.

To enter, each school team must:

1. Devise a computer game program which features ice lollies and;
2. List as many words as possible using letters from the phrase: 'Wall's and Acorn.'

There is no limit to the number of

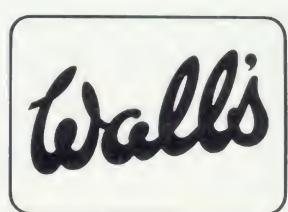
entries per school but each entry must be accompanied by fifteen MegaBytes lolly wrappers and arrive by 28 July 1984 at MegaBytes, PO Box 4XZ, LONDON W1A 4XZ.

Entries will be judged by a young computer games author and a team of professional programmers from Acornsoft. Points will be awarded for originality; quality of graphics; speed; sound effects; playability and overall presentation with attention to detail.

To win a computer, your school entry must have a high scoring game program and a sufficient number of words.

### FULL RULES

1. Entries can be submitted on cassette or disk and written in either BBC Basic or machine code, each entry being signed by the teacher of computer studies or head teacher of the school. Entries should run on a BBC Microcomputer Model B or Acorn Electron.
2. All games must be clearly identified and accompanied by a full printed listing as well as a games catalogue style description of the game (not more than 200 words). The cassette/disk and listing should each carry the entrant's name and address.
3. Each school may only win one prize, irrespective of the number of entries of games submitted. Entries will be acknowledged upon receipt but not returned. Correspondence will be entered into at the absolute discretion of the promoters.
4. The entry instructions constitute part of the competition rules and are binding upon entry.
5. Responsibility cannot be accepted for entries lost, damaged or delayed in transit to the competition address. Illegible or altered entries will be disqualified, as will those not conforming to the entry instructions.
6. Entries will be judged by a panel of judges which will contain at least one independent member not connected with the promoter. The decision of the judges will be final and legally binding and in all respects of the competition the decision of Birds Eye Wall's Limited shall be final.
7. Copyright in all material entered rests in Paragon Communications on behalf of Birds Eye Wall's Ltd., and Acornsoft Ltd.
8. Winning schools will be notified as soon as possible after the closing date. A list of winners will be sent to anyone who encloses a stamped addressed envelope with their competition entry.
9. Entry is open to all qualifying UK residents except for employees of Birds Eye Wall's and Acorn Computer, their advertising and promotion agencies, or anyone directly connected with the competition or their families.



## Radio cell option for micros

TO KEEP abreast of developments in the communications world the Editor and I made our way to the National Exhibition Centre in Birmingham where the electronics industry had gathered for Communications '84.

Several manufacturers were previewing their cellular radio systems which allow telephone subscribers to move about the country and have calls routed to them automatically.

This is accomplished

### Communications



by dividing the country into a number of hexagonal cells, each of which contains a radio transmitter/receiver.

Racal, one of the leaders in this area, was also displaying the new Epson PX8 portable computer which brief interrogation revealed as a statement of their intention to upgrade the cellular system to allow computer data transmission.

British Telecom had the Healthnet terminal on show. This is an Electron with a custom-made expansion box, and it is intended for use where a lot of form-filling is done at many separate sites. Very little technical information was available beyond what was in last month's *Acorn User*.

Thorn-EMI had a rather flash little package containing both a 1200/75 modem and terminal software for the Beeb, intended to sell for about £140. Dealers are being sought now.

The Epson PX8 portable mentioned earlier has some beautiful ergonomic touches such as fold-out legs for tilting up the back and a fold-up liquid crystal display. It runs CP/M from tape cassettes with an optional 80k RAM-disc which bolts neatly on the bottom. Tandy watch out! Alex van Someren

## Chip camera for Beeb – a 'Snap' at £130

THE makers of the Beastly, Commotion, are set to release an add-on 'eye' for the Beeb. The £130 EV1, also known as Snap, is a chip-based video camera which plugs into the user port to produce a black and white picture on a mode 4 screen.

The EV1, pictured above, is about the size of a cassette case and uses a standard lens supplied with the miniature Pentax 110 SLR camera. A 64k light sensitive RAM chip acts as the camera's 'film', though only 32k of this is actually used to produce the picture.

The chip itself has had its protective case sliced off so that its silicon base is exposed to light. The picture is converted into a digital form and fed into the Beeb's user port.

The picture is formed on the

lower half of the screen and has a resolution of 128 pixels vertically by 256 pixels horizontally. Using suitable software a panoramic full-screen picture is possible.

The software to produce the picture sits in 2k of memory below Hymem and is written in machine code. Also supplied with the EV1 is software to evaluate shapes. The camera produces an outline image of any objects in its field of view and then calculates their area, parameter and centre of gravity. Using this information programs can be written to enable the Beeb to recognise certain objects by comparing them with pre-programmed information.

Also available from Com-



by Bruce Smith

motion is the Beastly Arm at £32.95 (without servos). This robot arm can be supplied as a standard kit of parts or as a pick-and-mix set of modular parts. The arm consists of lengths of square section aluminium which fit into plastic housings. The Arm is interfaced to the user port via a Beastly (see Paul Beverley's review in May's *Acorn User*).

Software supplied with the arm allows the user to program a sequence of movements into the arm by editing them, as in a wordprocessor, into the main program. The arm will be supplied in kit form.

The EV1 and Beastly Arm will be available in the summer from Commotion at 241 Green St, Enfield, London EN3 7SJ.

## Coming soon: Z80 software in quantity

BUSINESS software for the BBC micro Z80 second processor is soon to be available in quantity from major UK distributor Software Limited.

Typical packages include the well-known Wordstar wordprocessor, dBaseII database manager, Supercalc and nearly 300 others. Prices are the same as for versions to run on other machines, eg Wordstar for £295, dBaseII for £438.

Software Limited have done all the necessary work, known as configuration, to allow the packages to be used as soon as you receive them. This involves providing the software on correctly formatted discs and alterations to allow use of the function keys on the BBC to replace the control-code combinations found on other micros.

Dealers will be provided with software by 24-hour Securicor delivery, and Software Limited will be providing

them with a telephone technical enquiry service. Under a contract with Software Limited, Acorn gave the company early access to the Z80.

Software Limited's marketing head Aidan Shackleton said: 'We believe that this contract with Acorn shows the way for future software distribution and co-operation between the hardware and software supplier.'

Shackleton also said preparations were being made to meet 'a huge demand' from users of CP/M on the BBC.

Dealers can contact Software Limited on 01-833 2601.

## Service deal set up by Acorn

KODE Services will provide on-site maintenance of all Acorn equipment within eight working hours.

Kode is claimed to be one of the country's largest maintenance contractors with engineers at six sites in the UK. Acorn's Customer Service Manager Mike Bicknell said: 'It's time Acorn provided the same servicing options to its major customers as other large computer manufacturers do.'

Kode contracts will not affect the normal Acorn guarantees. Non-dealer warranty repairs will still be taken care of by Retail Control Systems, Feltham, Middlesex.

Further details from Kode Services on (0249) 813771.

## GREMLINS HIT JUNE LISTING

THE GREMLINS have lost the end of a line of one of Paul Beverley's listings in last month's issue (yellow page vii, listing 2). Line 140 should read as printed below. Apologies to readers.

140 IF (?M% AND T%) > 0 THEN VDU255 ELSE VDU32

# Torch carries on with 'conflicting' products

**TORCH** is pushing ahead with its expansion plans despite being bought up by Acorn last month – and it looks set to continue giving its new parent a run for its money.

Neither company has announced any product cutbacks, and both appear to be carrying on as before. Vague proposals have been made for each to support the other's product ranges, but no definite decisions have been taken.

Several areas are set for conflict, however, the most immediate being the Z80 second processors. Torch had already sold about 6000 of its Z80 disc packs before Acorn's Z80 second processor was launched last month. Now it has made the Z80 card available separately for £263, which includes the Perfect range of CP/M-compatible software, undercutting the £299 offering from Acorn.

Another area of conflict is networking. Torch has Torchnet, an expansion of Acorn's Econet, while the parent also has involvement in two other networks.

But the big crunch is likely to come in the autumn with the launch of Acorn's business machine – or, more probably, machines. Both companies will then be supporting main-



'The two companies have an exceptionally high degree of compatibility in products, in strategic thinking and in management style. We believe this new grouping will become a major British entry into the world market for communicating business systems' – Bob Gilkes, Torch chairman

stream business systems, probably with similar specifications.

Torch already has its Winchester discs running (Acorn's are undergoing field trials), and a 68000 second processor, giving 32-bit processing (Acorn's equivalent to the 16032 is still not up to scratch).

The two companies have



'Torch's established position in business systems is a natural outlet for some of Acorn's own business systems products, and a rationalisation of the two companies' development efforts will give a substantial boost to both Acorn's and Torch's market prospects' – Alex Reid, Acorn director

long had close ties. At one time they shared offices and Torch was to be the business arm of Acorn. The two disagreed over policy and formal links were severed about two years ago – except one, that is: Acorn was contracted to supply Torch with BBC boards for its own range of computer products.

## Unicorn upgrades

**TORCH** has set out to tempt BBC owners along the upgrade path with a range of products under the 'Unicorn' banner – from a communications package to Winchester discs.

Unicorn kicks off the range at £185. It provides a BT-approved modem (OEL's Telemod) and software to access electronic mail and Prestel, as well as a mainframe link.

Next comes the Z80 second processor at £263, including bundled software, and the twin floppy disc pack combined with the Z80 disc pack at £699. Then come the two heavyweights.

First is the HDP240, a 20Mb hard disc pack. This also includes a 400k floppy disc

drive and can be connected direct to a BBC or via a network. A drive controller is included in the price of £1995.

Finally, there's the HDP68K, a hard disc pack with 68000 and Z80 processors built in. The 68000 chip handles 32-bit processing internally, but takes data in 16-bit chunks. This is the same chip as used in Sinclair's QL. Included in the box is a 400k floppy drive and 256k RAM.

Torch has implemented the Unix operating system on the 68000 and others are coming.

The 8088 chip, as used in the IBM PC, is already available in the Torch computer range, and so this is a likely contender as the next add-on processor for the BBC.

## Summer class for teachers

**MUSE** is to hold its annual summer course on computers in education at Nottingham University in July (23–25). Main speakers include John Coll of the MEP and Dr Max Bramer of the Open University.

There will be sessions on structured programming, BBC assembler, music, Logo, networking the Beeb and evaluating software.

The residential cost for the three days is £57.50, with a supplement of £11.50 for non-members. Details: MUSE, PO Box 43, Hull HU1 2HD.

## Beep 'n' board

**OCTOPUS** is again running its BBC-based computer courses in the summer holidays. Each is made up of five half-day sessions, costing £40.25 or £150 full-board.

Details from Octopus, St Joseph's Hall, Junction Rd, Oxford OX4 2UJ.

## Legal entry

FOLLOWING the threat of legal action by Acornsoft over Silversoft's database, *Viewbase*, Silversoft has renamed its product *Index*.

*Index*, which costs £24.99, now embodies an enhancement which makes it possible to create a file, enter data and alter the file structure without corrupting data.



**LION'S SHARE** – Lion Microcomputers is giving away £20,000 worth of computing prizes during an Acorn Week at its Tottenham Court Road microcomputer centre in London on July 9–15. The event is being co-sponsored by Acorn and Mirrorsoft, the Daily Mirror's software division. Among the exhibitors will be Software Ltd, demonstrating a range of CP/M software, Microware with new drives and Microvitec. Admission is by ticket.

# OUT NOW! 811 IDEAS FOR YOUR COMPUTER



In the Inmac catalogue of ideas for your computer check to see what is in the latest issue for you:

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Epson DX100—a new daisy wheel has the hallmark of Epson's quality performance and reliability. The **JUKI** daisywheel provides a quality normally found in printers costing far more. Printer cables, interfaces, ribbons, paper etc. are all normally available from stock.

6502 2nd Processor & Bit Stick now in stock.

## TORCH Z80 DISC PACK

The proven upgrade for the BBC Micro. Comprising 2 x 400K disc drive, Z80 processor with 64K of memory, and a CP/M compatible operating system, it opens up the vast range of CP/M software, including advanced languages, scientific and business applications. The system is supplied complete with the PERFECT software range including PERFECT WRITER, PERFECT SPELLER, PERFECT CALC, and PERFECT FILE. Full TORCHNET software is also supplied allowing sophisticated networking between other units. This will allow access to information, and communication, between up to 254 suitably upgraded BBCs.

**NEW TORCH Z80 PACK PRICE £699.  
SOFTWARE PACKAGE INCLUDES Z80 BASIC**

Phone for details about the 20Mbyte Hard Disc Pack, and the 68000 Hard Disc Pack with UNIX Operating System.

NOW AVAILABLE — The TORCH Z80 SECOND PROCESSOR CARD — for those who already have suitable disc drives. The card is supplied with all the free perfect software and Z80 basic, as detailed above, presenting a very attractive package. £299. Torch ZHD240 Mbyte Hard Disc + 400K Floppy £1,995(a).

## RH LIGHTPEN

The Acorn-approved superior design, with a programmable 'push-tip' switch, status indicator LED and an interface box. Supplied complete with manual, full software and basic demo programs. £39(c). Demo program on disc £7(d). Colour graphics. Cassette £8.65(d) Disc £10(d).

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# TECHNOMATIC

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Pair of Joysticks	£11.70c
Acorn Bit Stick	£328b

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TORCH Z80 Disk Pack	£699.00a
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TORCH ZHD240 20MH	£1995a

## UPGRADE KITS

A to B Upgrade Kit	£60.00d
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## BBC FIRMWARE

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Gremlin debug Rom	£28.00d
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Buzzbox Modem	£69.00b

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EPSON FX-100	£480.00a
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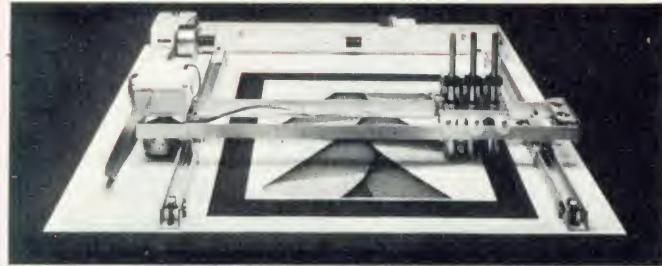
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Continued on page 14

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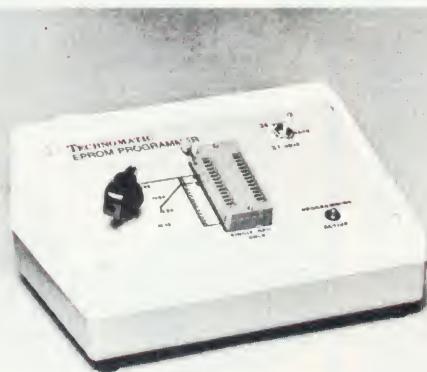
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## EPROM ERASERS



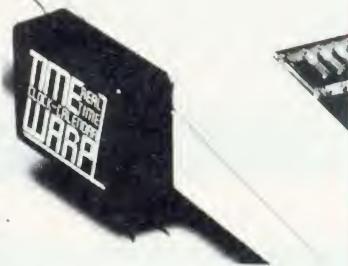
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# Vikings and maths in learning games

A 'MATHEMAGICAL' adventure called simply *L* is the latest creation of the Association of Teachers of Mathematics.

L aims to provide the appeal of a computer adventure based on puzzles and questions, without resorting to blood and slaughter.

*L* is aimed at school and home. It is supplied on 40-track disc for £10 by ATM, Kings Chambers, Queen Street, Derby DE1 3DA.

Dial Software has released two educational items, *Child's Play Pack* and *Spellwell*. The former is aimed at young children and contains four programs combining colourful graphics and speech on machines that have a speech synthesiser fitted. The latter is a spelling drill for all age groups, with five levels and a dictionary that the teacher or

parent can modify as the pupil's vocabulary increases.

*Happy Writing* from Bourne Educational runs on the BBC, Electron and, interestingly, the Amstrad CPC 464. It is designed to help children learn to write and combines animation, colour graphics and sound to keep the child's attention.

Fernleaf Software has a September launch planned for its *Viking England* package. This comprises four inter-linked programs to be used as part of a larger history project by children aged 9-13.

The children need to organise a raid, make a landing, explore inland and eventually settle down and try to develop a prosperous culture in Britain. Fernleaf Software is at Fernleaf House, 31 Old Road West, Gravesend, Kent DA11 01H.



## Wordwise to run on Aries board

WORDWISE, the wordprocessor on a chip from Computer Concepts, has been updated to make use of the Aries B20 RAM board.

This means *Wordwise* can be used with an 80-column display without losing text space. Computer Concepts will upgrade a *Wordwise* for £10.

*Caretaker* is Computer Concepts' Basic utility ROM. This provides extra commands to help de-bug and develop programs. It costs £33.35.

## Chip helps ROMs

MANAGER is a chip from Watford Electronics for users of sideways ROMs, and programmers who want to put software into EPROM.

It supplies extra information about some of the \*FX commands, and the ability to select ROMs, so avoiding any clash of commands.

The chip should be available now at an initial special offer price of about £21.

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# ROM SOFTWARE

for the BBC Micro

# Caretaker

## BASIC Utility ROM

**CARETAKER** is a BASIC utility ROM which provides many new invaluable commands to help the BASIC programmer. Because CARETAKER is in ROM, it uses no BASIC program space and its commands are always instantly available. Some of the CARETAKER commands are detailed below:

- **EXCHANGE** - provides a search and replace facility, either global or selective. 'Wildcard' characters and BASIC keyword tokens may be included.
- **EXPAND** - Lists a program in an easy-to-read form, also allowing 'squashed' programs to be read.
- **INSERT** - Enables BASIC routines on disc or tape to be inserted into or added to the program in memory.
- **KEYLOAD** and • **KEYSAVE** - Load and save the function key definitions.



• **LVAR** Lists the values of all or some of the variables.

• **MERGE** - Will merge one or more BASIC programs on file into the program in memory.

• **MOVE** - Allows the current BASIC program to be moved to a new page in memory.

• **PARTSAVE** - Saves only a selected section of a BASIC program (useful for later merging).

• **RENUMBER** - Renumbers parts of BASIC programs and moves the renumbered section as necessary.

• **RETRIEVE** - Restores a corrupted program to a form in which it can be listed and edited.

• **SINGLEKEY** - Enables BASIC keywords to be entered quickly, as on the ELECTRON.

• **SQUASH** - Reduces the size of a BASIC program in order to save memory space. A very efficient routine.

• **STATUS** - Displays the values of PAGE, HIMEM, program length, bytes free, etc.

• **TABSTOPS** - Provides a tabulation facility. Up to eight tabs can be defined.

CARETAKER is supplied with a spiral bound manual, special 'single key entry' stickers for the key fronts, and easy-to-follow fitting instructions. A full specification is available upon request.

### \*HELP CARETAKER

```
CARETAKER 1.00
CURSOR {ON/OFF}
EXCHANGE <old> <new> G/S <length>
EXPAND <start> <end>
INSERT <fsp> <lineno>
KEYLOAD <fsp>
KEYSAVE <fsp>
LVAR {F}{I}{S}{A}{P}
MOVE <address>
MERGE <fsp> <fsp>...
NORMALKEY
NOTAB
PARTSAVE <fsp> <start> <end>
RENUMBER <list> <inc> <start> <end>
RETRIEVE <bytes>
SINGLEKEY
SQUASH {S}{R}{M}
STATUS
TABSTOPS <columns...>
```

OS 1.2b

# New Release

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# Wordwise

£46.00 incl.



Formatting commands include the ability to split the document into pages of any length, with or without headings or footings. Page numbers may be printed automatically within the text, including within headings and footings. Commands are provided to set (at any point in the text) line length, left margin, tabulation positions, line spacing etc. Text can be centred on a line, indents and temporary indents can be set and cancelled. Output can be made to automatically pause at the end of a page, e.g. for a single sheet feed. Right justification of text can be turned on and off at any points in the text.

User defined keys may hold any required string as normal and used within WORDWISE, including the codes required to induce key operations such as cursor movement.

### ARIES compatible WORDWISE

A new version of WORDWISE is available upon request at the standard price which is fully compatible with the ARIES B20 RAM board. When fitted alongside the compatible WORDWISE, the ARIES board allows text to be previewed in 80 columns even with the normal RAM full of text. An upgrade from the standard version of WORDWISE is available. Please ask for details.



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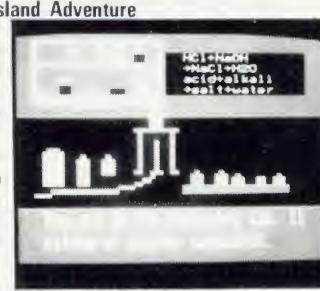


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Screen photograph



Screen photograph

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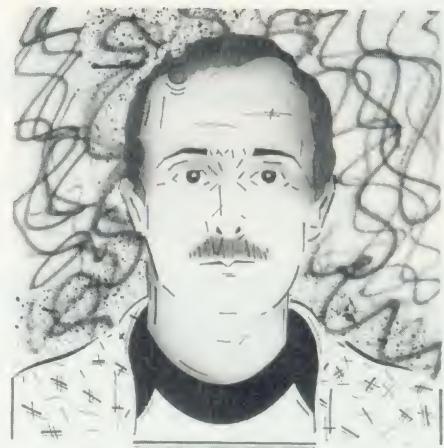
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# EXPANSION FACTOR

What does the Plus-1 add to the Elk?

Bruce Smith makes the connection



18

**P**LUS-1, the long-awaited Acorn interface for the Electron, has arrived, and without any of the delays that beset the computer industry these days. It adds the following capabilities to the Elk:

- Two cartridge slots for ROM-based software.
- A parallel printer port.
- Four eight bit analogue-to-digital input channels.

Aesthetically the interface is without frills but it complements the Electron to provide a neat and professional unit. Connecting the Plus-1 to the Elk is extremely simple and no difficulty should be encountered.

First, the plastic cover on the expansion bus must be removed to expose the edge connector. With both units upside-down, the protruding front edge of the interface is pushed over the expansion bus and into the recess at the rear underside of the computer.

Fixing the Plus-1 to the Elk is done with the aid of a coin! Two large bolts locate into the threaded holes in the Elk's case. The connection is firm and only a slight flexing is possible, so no problems with data corruption should be encountered. Once in place, the Plus-1 adds another 100 millimetres (4in) to the depth of the computer.

Externally there are four ports, two for the cartridge software and one each for the printer and ADC connector. Internally the main printed circuit board is more sparsely laid out than previous Acorn boards. Software for the Centronics printer interface, the ADC drivers and for downloading cartridge software were contained within an EPROM version 1.00 on the review model. Apart from the ADC chip, an ADC0844, and the OS EPROM, all chips are soldered directly to the main PCB.

The ROM cartridges can provide a variety of applications, including games, utilities and paged languages. Supplied with the review model were the six cartridges currently available: *Snapper*, *Hopper*, *Starship Command*, *Tree of Knowledge*, *Countdown to Doom* and *Lisp*.

Two sprung flaps on the rear mark the cartridge ports. A cartridge is inserted through a flap and into the

socket at the base. If two cartridges are inserted the nearer of the two has the higher priority and will be selected.

Once in position cartridge software is Chained simply by pressing the Break key, which boots the first file on the cartridge. Language ROM cartridges - *Lisp* in the review bundle - are switched in at &8000 and therefore replace Basic, which can be reselected by removing the language cartridge or typing \*BASIC.

The filing system used by the ROM cartridge system is in fact the \*ROM filing system (RFS) as used on the Beeb, making it a simple task for commercial establishments to blow their own cartridge ROMs. \*CAT, LOAD and CHAIN are all available with the RFS.

The ROM cartridges themselves are neat, slightly smaller than a cassette and the plug-in portion is a PCB edge connector. An interesting aspect of their design is that the silicon itself has been bonded onto the main PCB and coated with plastic to protect it, thereby doing away with the more expensive standard ROM packaging.

The printer port is a standard Centronics compatible parallel interface. CTRL B (VDU2) and CTRL C (VDU3) 'switch' the printer on and off for print-

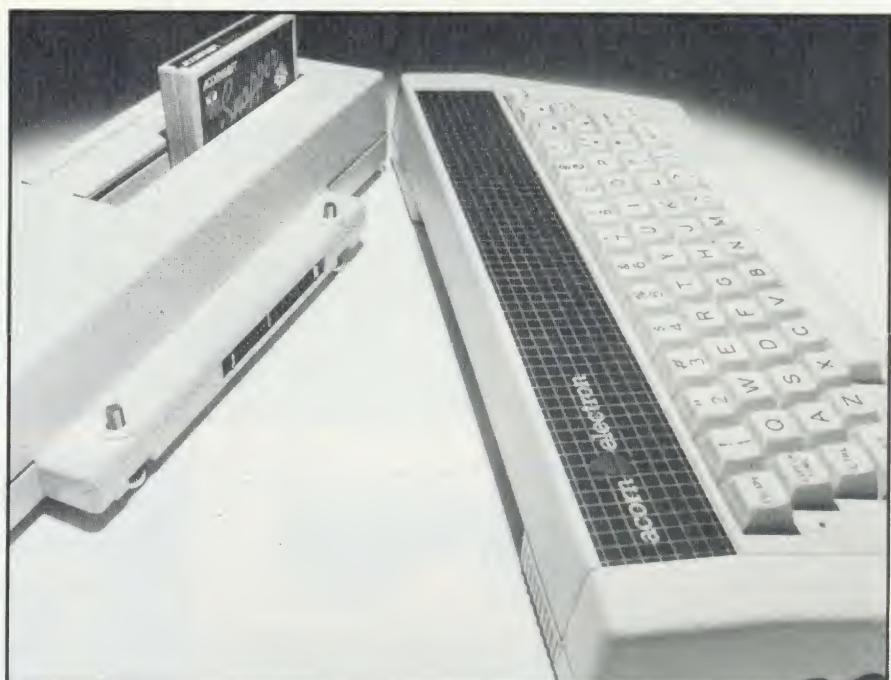
ing purposes, while VDU1 will send control characters to the printer. I had no problem using my Star Delta, and my screen dumps performed correctly. Several \*FX commands are included within the Plus-1 OS to help matters.

The most obvious use of the analogue interface for the home user is for connecting a joystick. Most of the games ROM cartridges are joystick-compatible and my Voltmace stick performed as expected, and any joystick with an impedance of at least 10 ohms would be suitable.

The ADC channels can be read from Basic using the ADVAL command, while \*FX16 allows channel selections to be made. The analogue port also allows various peripherals to be interfaced to the Electron, provided they are electrically compatible.

Full details on using the ADC and printer ports and on the cartridges are provided in the Plus-1 User Guide. The 22-page spiral-bound volume also contains lucid accounts of connecting the Plus-1 to the Elk.

The price of the Plus-1 - £59 - represents good value for a very useful unit. Acorn has got its sums right with the Plus-1, and it must be the first serious buy for an Electron owner.



The Plus-1's edge connector is simply pushed into the back of the Electron and bolted on

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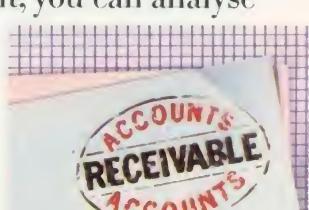
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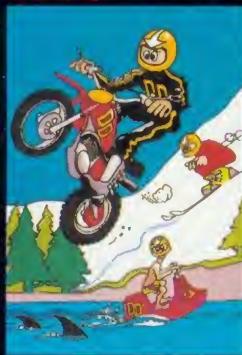


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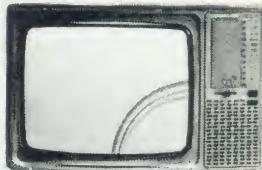
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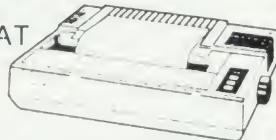
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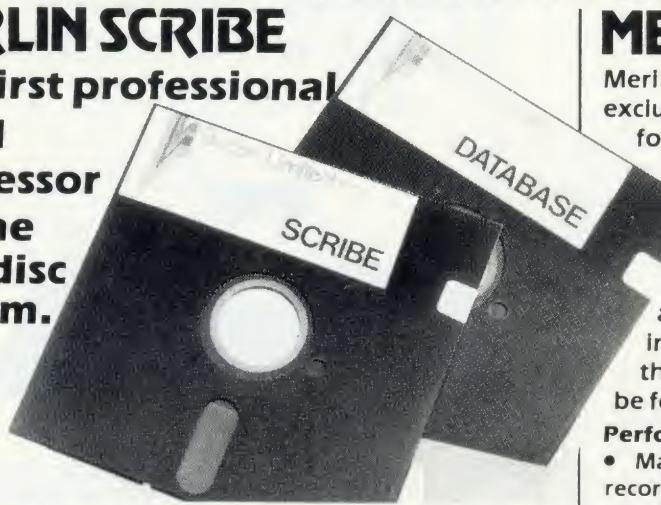
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# FUTURE CONNECTIONS

The new ideas in contact-by-computer



27

**C**OMMUNICATIONS for home computer users by satellite, cable and cellular radio is not just a distant possibility: it's happening now. On the following pages Joe Telford and Paul Curtis and Elliot Hessey look at the finer details of connecting personal computers to the public switched telephone network (PSTN, as it is known). The best is yet to come however, as faster, cheaper and more widely available methods of communication come on stream. Some manufacturers such as Torch and Commodore have taken the initiative and provided PSTN-based services for their customers already. Torch's Torch-Mail allows users of its business-oriented computers to exchange messages and software automatically, even when the machines are left unattended. This allows the computers to communicate when calls are cheap and with minimal effect on other telephone users.

One of the major new ideas in computer communications is distributed systems: the splitting of a large or complex task among a number of computers. This is logical for humans; only a moment's reflection brings examples such as the typing pool to mind. However, in the past computers have tended to be too expensive for all but the richest users to be able to exploit distributed computing. The advent of the microprocessor has changed all this.

Where a computer needs to exchange data with another distant computer, the PSTN provides a simple enough method. By merely adding a modem to most computers it is possible to send and receive data this way. Systems such as Micronet and bulletin boards are now very popular as a way for micro users to swap programs, hints and gossip. As the ways that we connect computers together improve, so we can expect to see more sophisticated uses of computers. It would be nice if you could leave your computer a list of things you want to know when you go to bed, and wake up the following morning to find your questions answered. This is what the Torch machines can do now.

A disadvantage of today's dial-up computers is that if the central machine breaks down all users suffer. To overcome this problem we can split the information that we want to store among a number of machines. This obviously complicates retrieving the information, but it means that one computer failure will not necessarily affect so many users. The second useful effect of distributed computing is the sharing of expensive resources such as hard discs or high-quality printers. Local area networks such as Econet permit

sharing of this kind on the small scale, but obviously we cannot wire the whole country into an Econet.

The PSTN is an obvious medium to use when introducing a distributed system. It is not really effective as a medium for high-speed data though, so further improvements are needed. Two new developments seem likely to be of help.

First, the introduction of cable TV will provide many homes with a very efficient medium right into the front room. The most important difference between cable and ordinary broadcast TV is that cable users can answer back. Initially, cable companies will use this facility to let viewers vote on programs and answer quizzes from their armchairs. It is also an almost perfect way

of sending computer data, and a fast one at that.

The other important new service is the introduction of cellular radio. This technique lets telephone users move around wherever they choose by using a hand-held or car telephone. The cellular radio control system will then route calls to them automatically. To begin with it will provide only a voice service just like the PSTN, but the operating companies are looking hard at the possibility of sending computer data too. Connecting telephone and television all around the world will link every subscriber with common data channels. The possibilities are mind-boggling – it's really just a question of how many users are willing to exercise their wallets.

THE TV production team working on the BBC's Computer Literacy Project has been using the telephone system to send data backwards and forwards in their work for some time. Robin Mudge, director of the recent *Computers in Control* series, and Clive Williamson, his assistant, are old hands at electronic mail and its uses.

For Robin, the worst part of being an assistant producer used to be script writing; not thinking of the ideas but the act of setting pen to paper. Each programme script has to be re-written many times as ideas develop, a thought he found depressing at best. However, Robin soon discovered wordprocessing through *Wordwise* and *View* on the BBC micro, and found them real life-savers. He could really enjoy writing, but quickly discovered limitations. Time spent out of the office researching stories meant no wordprocessor, as the BBC micro is not exactly ideal for carrying around. But the advent of portable micros, and British Telecom's electronic mail service called Gold, meant he could write on location and send the text back to base, where it could be worked on by a BBC micro.

The first useful portable computer was the Epson HX20. This was quickly followed by the Tandy model 100 and the NEC PC8201A and more recently the Sharp PC5000. Both the Tandy and NEC have large liquid crystal displays showing 40 columns by eight lines and come with limited wordprocessing and communications software. The latter enables the portable micro to communicate with another computer over the phone lines via an acoustic coupler. The coupler has two rubber cups that fit tightly over the mouth- and earpieces of an ordinary telephone handset, insulating it from sounds other than those produced by a small loudspeaker and microphone which transmit and receive the audible tones used to carry data. The Sharp PC5000 is one of the latest portables and although heavier than other lap computers, it has all the facilities of a 16-bit desk-top machine with an 80 column by eight line LCD display and runs application software from magnetic bubble cartridges, including a powerful wordprocessor and the essential communications software.

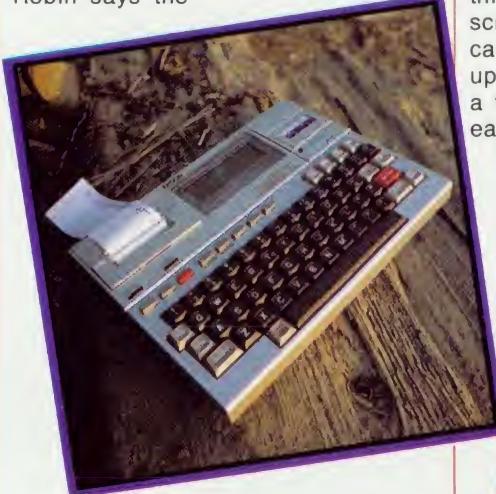
Robin prepares text on the portable and sends it over the phone into BT's electronic mail system. This can be done anywhere in the world as long as a telephone is available. At any time the BBC model B back at base can be connected to the electronic mail service and text loaded from it into a *View* or *Wordwise* file. Of course the system works in both directions, so messages can be sent to anybody. All

# II REMOTE

Paul Curtis and Elliot Hessey monitor

the members of the BBC's Computer Literacy team have an electronic mailbox and so can communicate with each other at any time.

Robin says the



system offers a great deal of flexibility. 'First, it gives users a great deal of freedom; you can move around with peace of mind knowing you are in contact with the office at all times. Second, it offers enormous flexibility in the use of different machines and software within the same group. As long as the micros can all talk to the electronic mail computer, text from any number of different machines and wordprocessing packages can be freely interchanged and merged. Of course it does have its drawbacks - you can't hide away! Gold can even tell the sender if you have read your messages. Also, I like my portable so much that it's difficult to stay in the office when the sun shines.'

In the comfort of his home in London, Clive Williamson uses a BBC micro to get at the information on Telecom Gold. His model B is fitted with a Computer Concepts *Communicator* ROM, and a modem. Both *Communicator* and modem can be set up to operate with a range of baud rates, so the system can work with either the 1200/75 or 300/300 standards available on Telecom Gold.

'To keep phone bills down,' Clive confides, 'I use the 1200/75 baud rate when I'm expecting to receive Robin's text, and 300/300 to send it back in its augmented form. A long file would take ages to send at 75 baud, which only

transmits at about seven characters per second. *Communicator's* parameters can be changed easily using a function-key driven menu to alter things like send and receive rates, screen display and telecommunications protocols. Once it has been set up, all the parameters can be saved as a file on disc or tape, and loaded in each time you switch on!'

The modem's default conditions are



suitable for 1200/75 operation on Telecom Gold, so Clive has to load in a file he has called '300/300' to work at the alternate rate. He also has to change some settings on the front of the modem to match the output from the BBC micro's RS423 serial interface.

Having sorted out his equipment, Clive dials the Telecom Gold computer, and as soon as he hears the carrier tone, switches the modem on line and replaces the telephone handset. The modem then maintains the connection, and Clive can log on to the system using his own account number and password. The modem gives a very reliable link to the BT computer because it makes a direct connection with the telephone line, but for this reason it is essential to obtain BT approval to use it.

The text file from Telecom Gold is in the form of a stream of ASCII characters and *Communicator* turns the BBC micro into a 'terminal' to receive the file, and display it on the screen. The text can also be printed out; or

# POSSIBILITIES

an application for electronic mail that involves strict deadlines

'spooled' to disc using the function keys. Once Clive has stored the file on disc, he can send notes to other users on the system before signing off to begin work on Robin's text. A spooled file can be read back into either *Wordwise* or *View*. Clive uses *View* to make his additions to the text, because of its extra functions like search, change or optional replace; and its 80 character display. When the additions have been made, he saves the work by opening a new file with \*SPOOL, and then uses *View*'s screen command to save another ASCII file on disc with a new file-name.

'The new file could then be sent straight back to Robin on Telecom Gold

for him to read and revise', says Clive, 'but I usually tidy it up first by running it through *Wordwise*. That way I can remove the unwanted carriage returns and the *View* command page heading that always creep into the file before you can use \*SPOOL to close it.'

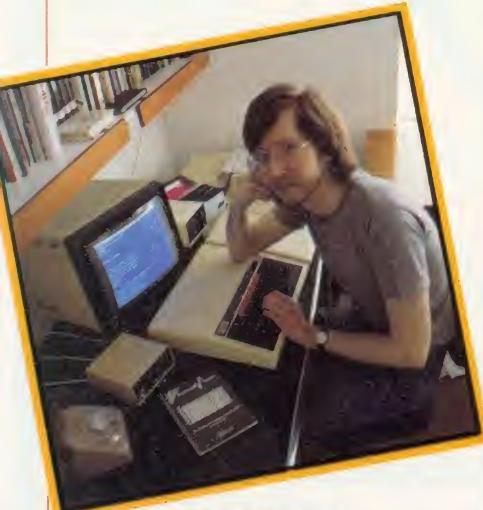
It seems that *Wordwise* provides the easiest medium for handling files from Telecom Gold, because its menu has a trouble-free option to read files in and spool them out again without the introduction of any extraneous characters. 'Using both *View* and *Wordwise* is a luxury,' explains Clive, 'and *Wordwise* alone would be quite sufficient!' With the new file on disc, Clive re-dials the Telecom Gold number (for the faster 300/300 rate this time) and logs on again to send the revised work to Robin's account number using \*EXEC through another of *Communicator's* options.

has obvious implications for small-business users, particularly those with 'reps' on the road. Reports and messages can easily be relayed over the system, irrespective of time differences between countries or people not being available at a particular time. Each user simply logs on to see what messages are waiting, and file a report if required. The cost of joining Telecom Gold is currently quite high (around £100 for the first month), but once some user groups have been set up (in the same way that Micronet 800 is available for microcomputer owners on Prestel) the price to the individual could drop. Then we would see the system in much wider use, and once that happens, electronic mail will certainly be here to stay.

29

## SENDATA 700B ACOUSTIC COUPLER

THE Sendata 700B is a compact battery operated acoustic coupler for use with any computer having an RS232 interface. It comes in one of two preset baud rates, 300 send and 300 receive for normal data transmission and 1200 send and 75 receive for use with Prestel-type services. The body of the coupler is made of two



LEFT TO RIGHT:

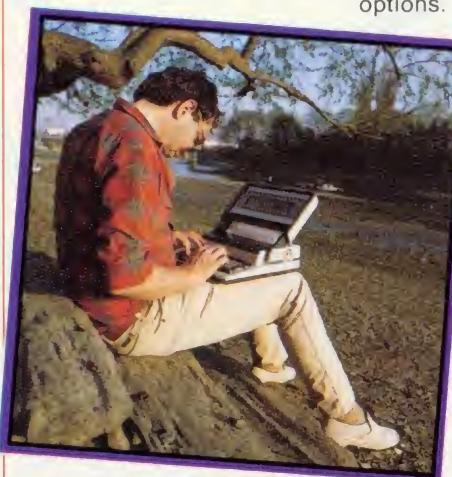
Epson HX20: a 16k, eight-bit portable with built-in printer and microcassette recorder running a communications software package from Transam in ROM. This package enables the little printer to print 80 character pages sideways! Optional extras include floppy disc and TV display. Starting price £480

Sendata 700B acoustic coupler. Supplied with rechargeable nickel-cadmium batteries and charger. Approx £250

Clive Williamson with his BBC model B and modem running Computer Concepts's *Communicator* ROM

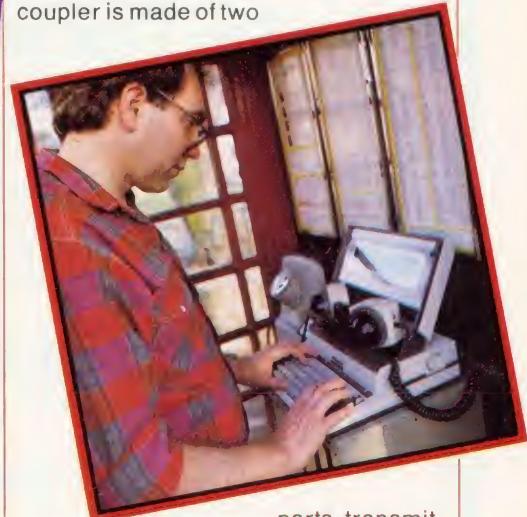
Robin Mudge with his Sharp PC5000 portable computer on Bank Holiday location!

Using an acoustic coupler, the portable micro can talk to the British Telecom electronic mail computer anywhere



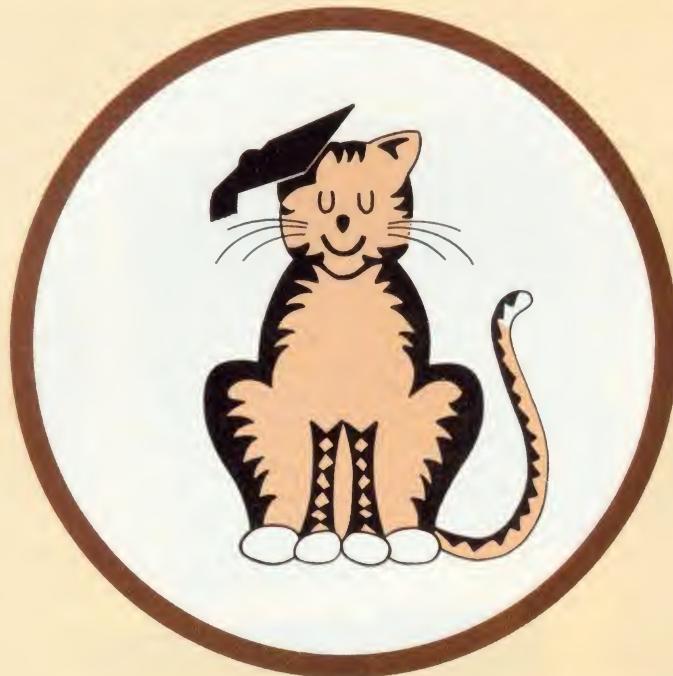
The receiving and sending procedure can be repeated as often as necessary to finish the work, with Robin picking up the text whenever he happens to be near a phone. Once finalised, the file can be printed out in the office and used as required. Clive recently wrote a piece for *Acorn User*, and was able to beat the post by sending it to the Editor's Telecom Gold account number, where it could be retrieved for immediate editing on a wordprocessor.

This approach to using telecommunications may seem a little ambitious for home users of the BBC micro, but it



parts, transmitter and receiver, which are joined by a flexible concertina-type section. This enables the coupler to fit a wide range of different handsets. It is clearly marked to show which way the telephone receiver should be fitted. The snug-fitting rubber cups insulate the

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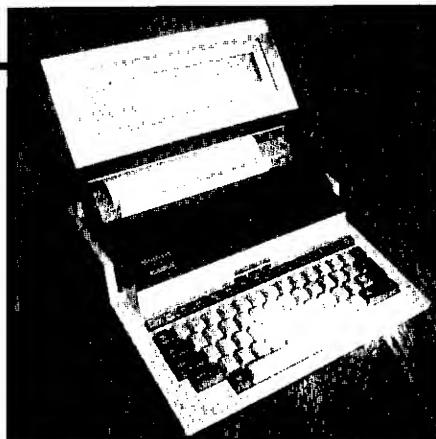
phone from outside noises that could interfere with data transmissions. Rechargeable batteries are contained within it and an external recharging unit is supplied. There is a small switch on the transmitter section that changes the operating mode from originate to answer. Using two of these couplers, computers can communicate directly, one originating data and the other answering it. Cost about £250.

#### MINOR MIRACLES WS2000

THE Minor Miracles WS2000 is one representative from the 'new wave' of low-cost modems currently appearing, and offers more facilities than most. At the moment, however, it awaits British Telecom approval.

#### COMMUNICATOR

Computer Concepts' *Communicator* program is supplied as a 16k plug-in EPROM, and is ideal for use with modems. In its basic configuration it



**Sharp PC5000:** this 128k, 16-bit machine has an 80-character by eight-line display and optional thermal printer running Superwriter software under MS-DOS. Options include 128k bubble memory packs, 64k expansion RAM modules, floppy disc drives, full range of MS-DOS software. Starting price £1195

can be used to communicate with Telecom Gold at the 1200/75 rate, but its parameters may be changed to accommodate many other modes of operation. It is also designed to turn the BBC

micro into a mini or mainframe terminal, and can pretend to be a DEC VT100 or VT52 terminal. This well-designed ROM generates a series of clear menus to help set up the parameters, and these can be saved as a file and loaded again to speed up future use. It is also possible to edit the Beeb's user-definable function keys to generate strings, such as ID codes for logging on to particular computers.

*Communicator* works with the second processor, but current versions will not reset when the micro's BREAK key is pressed. It works perfectly with an unexpanded BBC micro, however, and normally gives a pleasant white-on-blue 80 column display. *Communicator* costs £69.

Computer Concepts also markets a language ROM for the BBC micro called *Termi* which costs considerably less at £33 and offers many of the facilities of *Communicator*, but without the frills. *Termi* is on an 8k EPROM and will work with or without the second processor.

## BUZZWORDS

### A glossary of terms used in computerised communications

**Acoustic coupler** Device for connecting a computer to the phone lines via the telephone handset.

**Baud rate** Serial transmission rate in bits per second.

**BT** British Telecom.

**Carrier** A high-pitched tone which 'carries' the transmitted signal.

**Carrier detect** An output line from the modem to the computer which indicates a carrier is present.

**Control register** Information written to this register commands the ACIA to perform certain tasks.

**Dumb terminal** A terminal which can only transmit and receive. Information cannot be passed to and from printer and discs.

**Electronic mail** Information sent between people using entirely electronic means.

**Even parity** Where the total of bits set to the binary value 1 in a byte plus the parity bit will be an even number.

**Full duplex** Mode of operation of a communications system where the host computer re-transmits every character it receives. This verifies the reception of the characters.

**Half duplex** Mode of operation where the terminal prints each character as it is sent. Half-duplex terminals on full-duplex systems give ddoouubbllie tteexxtt..

**Hacker** American term for hobbyist computer user (recently associated with electronic communications in the movie *War Games*)

**Hardcopy** Printout from a computer or generally print on paper.

**Host** An answering (usually large) computer system which you can use with a terminal.

**Log off** Leave a host system.

**Log on** Connect with a host system.

**Mark** The time during which a bit is set to 1.

**Modem** From the word *modulator-demodulator*. A device which connects a computer directly to the phone lines. Needs BT approval.

**Odd parity** Where the total of bits set to 1 in a byte of data plus the parity bit will be an odd number.

**Off-line** When a printer or terminal is disconnected from a host computer it is said to be 'off-line'.

**On-line** When a printer or terminal is connected to a host computer it is said to be 'on-line'.

**Parity** To check the integrity of data some systems include an extra bit, called a parity bit in each word transmitted. From this bit it is possible to tell whether the word has been transmitted correctly.

**Register (ACIA)** An area of memory (1 byte) shared between computer and ACIA.

**Ring detect** An output line from a modem to a computer which indicates that the phone is ringing. (NB in most auto-answer modems, the phone bell does not sound).

**Smart terminal** A terminal which can cope with accesses to its own disc and printer. It can normally send and receive whole files which can be stored or printed out.

**Space** The time during which a bit is set to 0.

**Start bit** The first bit transmitted serially. It indicates the start of a word.

**Status register** Register in the ACIA which contains the present state of the ACIA hardware.

**Stop bit/s** The last bit or two bits transmitted in the word.

**Terminal** A keyboard and screen or a BBC micro with RS423 software capable of communicating with a (large/r) computer.

**Word** Group of bits which make up the serial transmission parameters for any character.

Joe Telford's primer on turning the Beeb into a terminal: how the systems work, hardware, software, and a comms simulator



so one might find accounts for firms like Acorn, BBC, MEP, Amstrad and others.

## Equipment

Contacting any of the services detailed above requires a certain amount of equipment. The simplest needs are:

- BBC micro (model B) + monitor.
- Modem or acoustic coupler.
- Terminal software.
- Telephone.

The micro needs no further explanation, and the telephone is an obvious requirement.

Software must reflect your needs, and although this article provides some dumb terminal software, users might find purpose-built 'smart packages' (eg *Termi* or *Communicator* from Computer Concepts) more useful. 'Smart' terminal software will allow the use of discs and printers, enabling wordprocessed files to be sent and received via the phone lines.

The modem or acoustic coupler is worth considering carefully. An acoustic coupler can be attached to a telephone simply by pressing the telephone handset into the coupler. Beware, however, of the older couplers and the newer slimline phones - they just don't fit together. An acoustic coupler costs £50 upwards. The main disadvantages is that the coupler is often sensitive to vibration, line interference and external noise. (One cheap coupler I used would function properly only when laid on a sponge rubber pad, and covered with towels!)

Modems are more reliable, but have their own problems. First, they connect directly to the phone line, and therefore *must* be approved by BT. Second the modem plugs into the new-style BT wall sockets, and you may need to have these fitted. Approved modems will carry a sticker with a green circle and the text: 'Approved for use with telecommunication systems run by British Telecommunications in accordance with the conditions in the instructions for use. BT Approval No. ....' BT may well ask which modem you want to use, and require you to quote the approval number and the name of the modem.

32

# LOGGING ON

ONCE upon a time when I wanted to get text to our illustrious Editor, I would call on the services of a local pigeon expert and dispatch a 'jotting', tied to the leg on Acorn Fancier's bird. However, times have changed, and Kitty no longer enjoys her trip to the top of Nelson's column to pick up the mail. Spurred on by John Coll's article (October 82) I have been looking at electronic mail and information systems available to the average Acorn user through telephone links.

There are a number of services available, including: commercial mail order systems; bulletin boards; information providers and electronic mailboxes. A system normally has one of these as a main task, but often supports additional features. For example, British Telecom's Prestel is an information provider, but items and services can be bought on Prestel, and in addition mail can be sent and received through its Microcomputing section which has recently replaced Micronet.

### Commercial mail order systems

An electronic mail order system allows people to dial a distant computer which contains a database of items, from which to choose. Prices tend to be always up-to-date, and customers can be immediately informed of items out of stock. Payment can be made by quoting credit card numbers. A typical example is Distel, which contains a catalogue of electronic components and information. Such commercial databases are expanding, so that in the future many services will be available via computer.

### Bulletin boards

Many bulletin boards are run by amateurs or user groups. On dialling a bulletin board, facilities such as read-

ing messages; deleting your own messages; writing messages and examining various activity notices are often available. Bulletin boards seem to be the computer user's equivalent of CB radio, although the American disease of 'handles' is not widespread. I don't feel inclined to reply to 'The Magnetic Surfer' on line from California, but I might talk to 'Ian Birnbaum' on line from Hull. A typical board might be Forum-80 which is based in Hull. Prestel also includes closed user groups like Micronet 800 and Viewfax. On joining these, access is automatically gained to Prestel, though not the other way round.

### Information providers

Prestel is fast being recognised as chief among the information providers. With appropriate software, it is possible to receive coloured teletext screens from Prestel on a number of topics. Prestel produces a directory of information and news items, which is delivered to members. One useful point is that many companies joining Prestel become information providers. One of the latest is Kodak, which details its current products as well as general photographic hints and tips.

### Electronic mailboxes

Electronic mailboxes provide a message service between subscribers which works on the principle of sending and receiving mail to private mailboxes. Such a system can contain confidential information, and system operators must apply the highest standards to achieve true data privacy. A typical electronic mail system is British Telecom Gold (BTG). This allows mail to be sent, received, deleted and carbon copied between users. In addition, it gives access to a noticeboard, diary and conferencing system. BTG subscribers are normally companies who operate a user group within the system,

## Baud rates

When choosing a modem or coupler, one important point to consider is the 'baud rate' which gives a measure of how fast information is carried. There are three common transmission rates:

Transmit	Receive
300 baud	300 baud
75 baud	1200 baud
1200 baud	1200 baud

Most common is the 300/300 rate, but this is quite slow and so the others are becoming more used. Modems which handle the higher rates are generally more expensive, though the range starts at about £70. Readers should note also that Prestel particularly requires the 75/1200 rate.

## Costs

Unlike many applications of the BBC computer, electronic communication has a number of costs after the equipment has been purchased, the most obvious of which is paging for phone calls. Readers should be aware that few calls will be shorter than 10 minutes. Many readers will not be within a local call of a computer system, so a 10-minute, 'b' rate call (to a system further than 35 miles) will cost £2.50 at peak time, and £1.90 at standard time. Amateurs may find cheap time best for their electronic communications.

Costs are at present:

Cheap time distance	Time for 4.4p (direct dialling)
Local	8 mins
Up to 35 miles	144 sec
Over 35 miles	60 sec

Cheap time is 6pm to 8pm weekdays and all day Saturday and Sunday. A typical 10-minute phone call to Distel will cost 44p. Distel and some of the bulletin boards are cheap, or free to access. Many of the larger ones like Prestel and BTG have other charges. Before joining any mailbox system, users must ask certain questions, as in table 1. If you don't ask these questions, quite a surprise may arrive in a phone bill or membership account. These costs can be reduced greatly by following the 'golden' rules, outlined in table 2.

## Connecting to a distant computer

How you contact a distant computer varies depending on your equipment and on the system in question. A typical sequence of events is as follows. First, connect your modem or coupler to the BBC micro and power up your own system, then load and run the terminal software. At this point many modems or couplers confirm that they are transmit-

- What is the cost of my phone calls likely to be?
- What is the membership fee?
- How often must it be paid?
- Is there a charge for 'computer time' on the system?
- If so, what is that cost per minute or per phone call?
- Is there a charge for storing information on this system?
- If so, what is it in terms of cost per month per k stored?
- Is there a charge for retrieving information stored by others?
- If so what is it likely to be?

Table 1. Questions to ask about costs

- Make each call purposeful; ie know what you are doing. Do it, then log off.
- Always access the system from as close as possible, eg it is possible to enter BTG or Prestel via 18 nodes around the country. This saves phone bills.
- Never write long messages via the phone lines. Buy 'smart' software and transmit messages from disc.
- Get a hard copy of your favourite system's 'help' files and know how to use them before going on-line.
- Use as fast a transmit/receive rate as possible.
- At the end of your phone call hang up immediately. You may still be connected via BT.

Table 2. Golden rules for cutting costs

ting (for example, the Buzzbox modem and the K&N acoustic coupler pulse a 'DATA' light with each keypress). Now dial the number required on your phone and wait to be connected. When you hear a high pitched tone (from the phone) push the handset into the coupler. If you have a modem press the 'data' button. Some systems will immediately produce text on screen, but many need to hear your 'mark' to say you are there. Try pressing the return key a few times and check for a response. Once you have text on screen you are into the system. Some computers require a further stage called 'logging on'. This will require you to give some information such as name, address, and/or a password. Failure to comply often results in disconnection. After using any system, always log off with the correct command or menu option, rather than simply hanging up, otherwise you could be paying for machine time you aren't using.

## Transmitting from the Beeb

The RS423 port on the BBC micro allows information to be sent not just to other computers but also to printers, and modems. It is therefore useful to know what is happening inside the computer whenever a signal is sent. Figure 1 shows the internal organisation of the BBC computer around the RS423 system. A signal from a key on the keyboard is processed and passed to the ACIA chip located at a particular set of memory addresses. From the ACIA the signal travels to the serial ULA from which it is sent to the RS423 output line.

If a modem is used, this signal is further modified for transmission via the phone lines.

In transmitting a byte on the RS423 system, the user provides a data byte which will always, on the BBC micro, be eight bits long. If we are transmitting to another BBC micro then sending eight bits is quite acceptable. However, some telephone systems (eg BTG) only use the least significant seven bits of a byte, and so transmission – and particularly reception – should make use of the seven-bit option in the ACIA control register. This is the complete ASCII character set, so all text characters will be transmitted.

To check on information we send an extra bit of data which is set high or low depending on the number of 1s in the byte we are transmitting called 'parity checking'. In odd parity, the number of 1s including the parity bit will be odd, while in even parity the number of 1s will be even. Considering the letter A in odd parity we would send:

A = 1 for odd parity + 01000001 = 10100001

In even parity we would send:

A = 0 for even parity + 01000001 = 00100001

## The actual transmission

Imagine we are transmitting the letter A above with eight data bits, odd parity, and one stop bit. The actual series of pulses from the RS423 port might be:

0 10000010 1 0  
Start bit lo data hi parity Stop bit  
Transmission should be read left to right.

Between BBC micros, the 1s and 0s would effectively be transitions between voltage levels (figure 2). If a modem or acoustic coupler is used, the voltage levels would be converted to high and low pitched sounds, so binary 0 might be represented by a tone of say 2400Hz (though the actual tone depends on the type of modem) while binary 1 could be represented by a lower tone (figure 3).

## Simulating RS423 transmission

Program 1 (pages iii-iv) is an RS423 transmission simulator, which demonstrates each step of the process in sending a signal via the RS423 port. Once it has been typed in and saved, run it. You will be asked how many bits (seven or eight) are used to transmit data. Next the type of parity is entered, and finally the number of stop bits. In these three questions, the program will not allow word formats which are not available on the BBC micro. Errors are flagged by a beep and an error message. The opportunity to re-enter data is given at each point where an error occurs, with the exception that where only two choices occur, the computer will select the correct choice to make up the word format, after an incorrect input.

Once the three questions have been answered, the program displays the transmission screen. Whenever a CTS signal is available, shown by a light on the display panel, characters may be typed at the keyboard. Each character is shown in the box marked 'CHR'. If it is a control character (less than 32 or more than 126) then the symbol 'CTL' appears in its place.

The next stage in the decoding process is to find the ASCII equivalent of the number. This is placed in the box marked 'ASC'. On the other side of the screen is a box marked 'BINARY'. Into this is placed the binary equivalent of the character, plus the extra bits needed to make up a word for RS423 transmission. Reading from left to right there will be a start bit (0); seven/eight data bits (1s or 0s); a parity bit if parity is being checked; one or two stop bits (1s).

The final two boxes show first what might be the output from the RS423 port in terms of voltage levels, and second what might be the output from a modem in terms of changing frequencies. After the boxes have been updated, each binary digit is converted into a sound and so the complete binary word is heard as a sound something like the transmission from an acoustic coupler. (I decided against having a continual carrier tone as a constant high pitched sound can be annoying.)

Now let's run through the program structure and indicate the main procedures. PROCinit is the first procedure called. It sets up a number of character definitions, dimensions a numeric array and transfers the escape function to the CTRL-@ key. The program then enters its main loop. Exit from this is only by break or CTRL-@. The main repeat loop calls two procedures directly (PROCmenu and PROCsetscreen), then enters a further

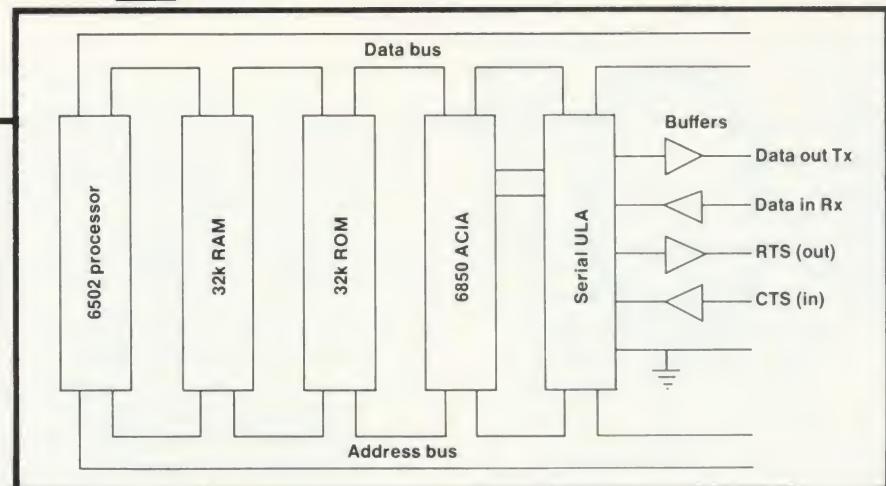


Figure 1. The BBC's RS423 hardware

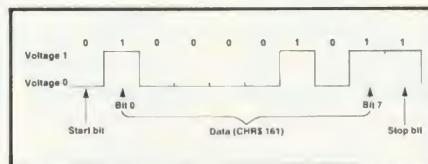


Figure 2. RS423 port output (eight data bits, no parity, one stop bit)

repeat loop, which handles the actual simulation.

PROCmenu (from lines 250-450) handles the word format of the data to be transmitted. This is done by three sections, where lines 270 to 290 handle the input of data bits per word. Lines 300 to 380 handle the input of the type of parity, and ensure it matches the 'legal' BBC requirements for the number of data bits already entered. The use of the INSTR function in line 330 allows the parity input as a string to be converted to a number. In line 380, this number is further reduced to 0 (no parity), 1 (odd parity) or 2 (even parity).

PROCsetscreen is called after switching to screen mode 4 in line 70. The aim of this is to set up the screen display for the actual simulation, and in so doing, it makes much use of repeated calls to PROCreCt. Once the screen is set up PROCcrsr is called to turn off the cursor.

PROCreCt simply takes four parameters: bottom-left, x-coordinate of rectangle; bottom-left, y-coordinate of rectangle; length of rectangle; width of rectangle; and draws the rectangle specified.

The actual simulation for any set word format is handled in lines 80 to 110. This repeat loop calls one function and one procedure, until the escape key (*not* CTRL-@) is pressed. When escape is pressed, the execution of the program returns to the external REPEAT...UNTIL FALSE loop, whereupon the word format is again requested.

FNtype is a short function which calls PROCcts to turn on the clear to send light, then waits for any character to be typed. To more fully simulate the RS423 CTS line, the function flushes any type ahead buffer which might

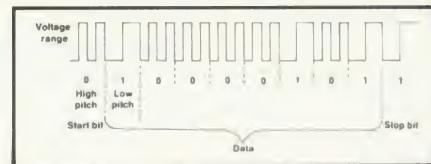


Figure 3. Output from modem (eight data bits, no parity, one stop bit)

exist by issuing a \*FX21,0 at line 740.

PROCsend takes the input from FNtype and encodes it to the specified word format. To do this it relies on a number of sub-procedures: PROCbinary, PROCRS423, PROCMODEM, PROCsound. Before calling any of these, PROCcts is called again, this time to turn the 'light' off. Correctly speaking, the CTS line will not go low until the receiving computer has taken the outgoing data. The simulation appears more realistic however, if we alter the CTS indicator at this point.

PROCbinary calculates the binary word for transmission, and places it into the array 'binary()'. It then calls PROCprintbin which simply reprints the information in the correct screen box. PROCRS423 takes the information in the array 'binary()' and builds up a voltage picture in the RS423 box on screen. This is done in lines 1130 to 1150. PROCMODEM takes the information in the array 'binary()' and builds up a frequency picture in the 'MODEM' box on screen. This is done in lines 1190 to 1210. PROCsound takes the information in the array 'binary()' and transmits it via the sound command, to simulate an acoustic coupler. This is done in lines 1230 to 1250.

Although the program will satisfy many readers, it could be enhanced by the addition of a facility to read and translate random or preset data strings (ie the Rx side of transmission). Many of the necessary procedures will be the same, and hence are already written, simply calculating the binary information then calling the last few procedures in reverse should produce a useful addition. Of course an RTS function will need adding, much like PROCcts. A final thought would be to try to improve typing speed. page 38 ▶



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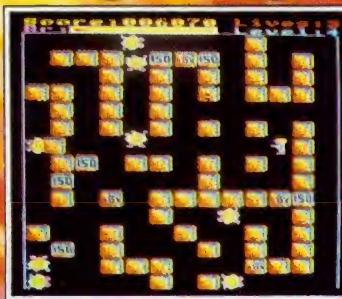
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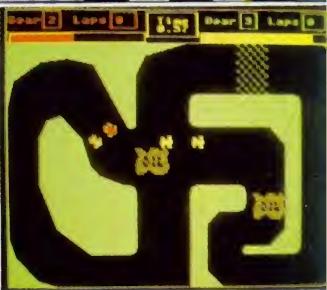
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## Comms software

Regular readers will remember how back in June 1983 we demonstrated how the BBC micro could be used to produce a 50p network. The idea was that one machine (usually with a DFS interface) could supply Basic programs to others with a simple connection and a couple of commands. Figure 4 shows the connections for a piece of five-core cable. This simple set-up has now been tried at distances over 20 metres in schools, as an inter-classroom loading system. In the home it's an easy way of stopping your children swiping your disc drives. (Keeping one's heirs out of one's hair eh? - Ed.)

Although I used a rather lengthy command line to RTX programs, much practice on the part of my daughter has reduced the sequence for transferring programs from one machine to another to that in table 3 (NB the comments in brackets may not apply to all readers).

In this way, BBC computers will swap lists without any problem at all. Points to check if problems do exist are:

- Is the lead OK? Shortened pins are common, as too are broken wires inside the plastic sheaths. The solution is a continuity tester or multimeter set to measure resistance.
- Are you using screened cable? Unscreened cable is more likely to pick up noise.
- Is the distance over which you are transmitting great? You may need pull-up resistors fitting inside the BBC micro (see *User Guide*). An alternative here might be to reduce the baud rate.
- Have you made sure the Rx micro has no program in memory? The RTX system for transmitting Basic programs is similar to EXECing programs, Txing into a 'full' micro can be quite slow.

The BBC micro will of course allow us to talk to other machines quite easily, even if the hardware handshake lines, CTS and RTS are not available. In this case communications speed might need to be reduced to 1200 baud or less, to avoid losing characters. A typical communications program for BBC to BBC might be as in program 2.

If the CTS and RTS lines are connected, then this appears to work up to 19200 baud, though note that the \*FX8,x and \*FX7,x lines have been omitted. They will need to be included in most applications. Remember, however, to set the baud rates on each machine to match. This type of terminal program is called a 'half' duplex program, because each half of the communicating system prints its own characters before transmitting them to the distant station.

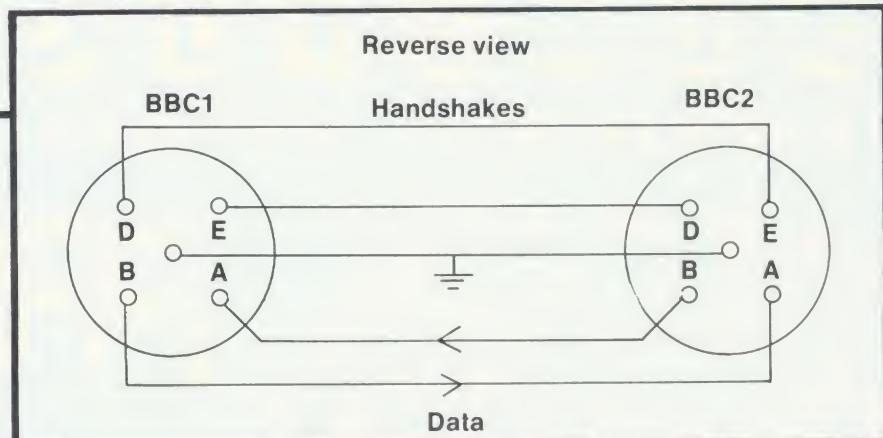


Figure 4. Connecting two BBC micros via the RS423 port

Many common systems have what is called a full duplex terminal mode. This is shown in program 3, where the distant terminal must be responsible for returning the characters typed at the keyboard. This program is set for 300baud comms by lines 5 and 6. The main body is an infinite loop which simply checks for a character entering the serial port. If one exists, it is printed. The keyboard buffer is then checked for characters, at line 20 and any character found is transmitted to the distant computer. This will continue until ESCAPE is pressed.

1. Connect lead to Rx micro.
2. Perform CTRL BREAK on Rx micro.
3. Type \*FX2,1 on Rx micro (Run down stairs. Power-up Dad's system).
4. Connect lead to Tx micro.
5. Load program for Tx-ing.
6. Type \*FX5,2 on Tx micro.
7. Type LIST(CTRL-B) on Tx micro.
8. When the program has listed, return the Tx micro to its original state (because Dad can't do adventures. Run back upstairs).
9. Press BREAK on the Rx machine.
10. Type OLD on the Rx machine.
11. The program is ready to run.

Table 3. Transfer sequence from Beeb to Beeb

When SHIFT-f0 (shifted function key 0) is pressed, character 128 is generated, and when SHIFT-f1 is pressed, character 129 is generated. We can add to our program so that whenever SHIFT-f0 is pressed, we enter mode 7, and SHIFT-f1 puts us into mode 3.

Alter line 20 to:

20 A\$=INKEY\$(0)

then add:

```
25 IF A$=CHR$128 THEN
    MODE7:UNTIL0
    ELSE IF A$=CHR$129 THEN
```

MODE3:
UNTIL0
26 IF A\$<>""?&FE09=ASCA\$

Once equipped with a modem and terminal software, the 'Happy Hacker' can look for a few 'war games' to start. Perhaps the most useful commercial services are:

Distel 01-697 1888 (London)  
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## Run your own

Ever thought of running your own mailbox? This question was posed by schools in Cleveland and an experimental service is at present operating for local schools. This service, called CECCTEL, will eventually provide a software titles list as well as a bulletin service and set of mailboxes. These are all at present in an embryonic state, and experiments with downloading usable software are being carried out. Schools using the service are provided with simple software to allow communication and downloading, though at present they must provide their own couplers. The system runs at 300 baud and is overseen by a trusty BBC micro.

Providing you have an auto answer modem and a BBC micro it's not that difficult to duplicate this sort of system. I would however, encourage home-users to develop a good deal of patience because once you go on-line as a bulletin board, you will be fair game for 24-hour phone calls - and the odd visit from BT. You will almost certainly need a second line, so that your 'normal' existence of talking to people can continue, and it is imperative that the two phone numbers are kept separate.

The problem with auto-answer modems is that they need extra connecting hardware to the BBC micro. Where for example, is the 'ring detect' input to the BBC micro or the 'carrier detect' input? How can the BBC micro

latch the modem to answer while the carrier is present? These are the problem areas of most users. However, we can configure the many interfaces of the BBC micro to meet these challenges.

Latching the modem relay is quite simple. All that is needed is a voltage to be supplied to the appropriate pin on the modem. (The actual connection and voltage may vary between modems.) One simple solution is shown in figure 5 where the modem supplies the switching voltage and the BBC micro switches it via the cassette relay, given a simple procedure like:

```
DEFPROClatch(x)
IFx = 1 THEN *MOTOR1
IFx = 0 THEN *MOTOR0
ENDPROC
```

On many modems the ring detect and carrier detect signals are brought out to a connector. Examining the voltages on the corresponding pins shows a change between -6v and +6v when ringing is detected or when a carrier signal is present. This voltage can drive a small relay, external to both the BBC micro and the modem, which simply shorts to ground one of the

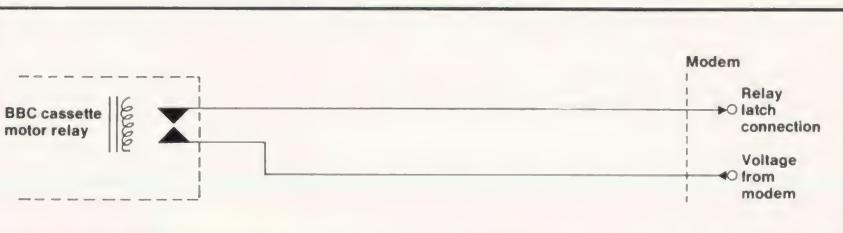


Figure 5. Latching the relay in the modem for auto answer

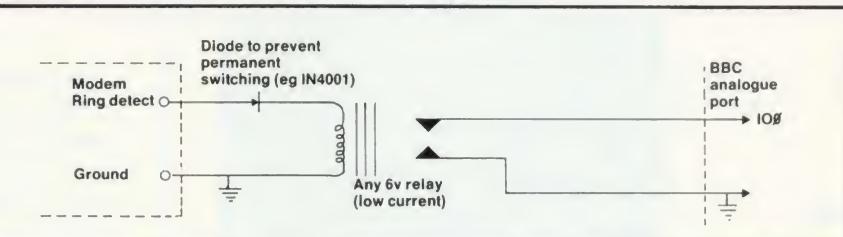


Figure 6. Passing the ring detect to BBC micro (for carrier detect, signal would go to IO1 on the analogue port)

games buttons (figure 6). A simple ring detect procedure might be:

```
DEF PROCrngdetect
REPEAT UNTIL (ADVAL0 AND 3)=1
PROClatch(1)
ENDPROC
```

and a similar function for the carrier signal (which must be checked regularly) might be:

```
DEF FNcarrier
IF (ADVAL0 AND 3)=2 THEN =1
ELSE =0
```

The circuitry for passing the carrier detect is similar to that for the ring detect. If you have any worries about your competence to handle modem circuitry, then it is best to leave well alone. British Telecom do not approve of DIY modems adding extraneous (and possibly lethal) voltages to the phone lines, so remember get a BT-approved modem, or an acoustic coupler; keep any modifications between the modem and the computer; do not introduce voltages or shorts to the phone lines.

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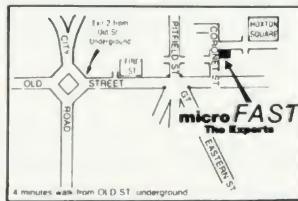
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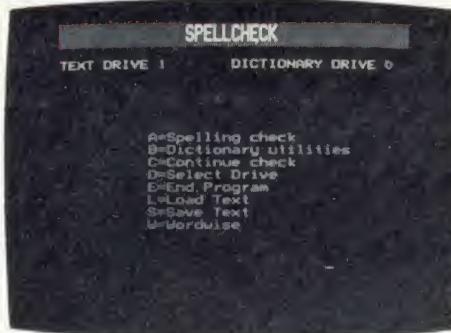
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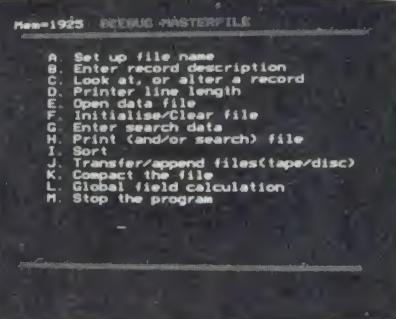
Separate versions of the program are available for cassette and disc based systems. The disc version uses random access files to maximise record storage.

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## TECHNICAL INFORMATION

The cassette version will allow up to 10 fields to be specified per record. Any number of files may be set up, and each file may hold about 110 records (based on a typical 5 field record).

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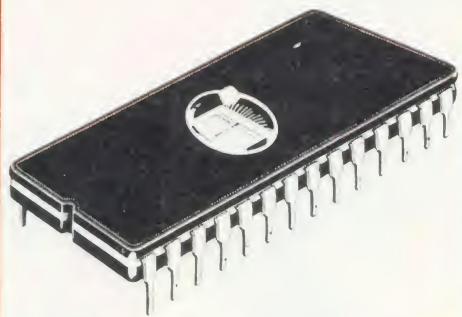
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*UTIL 3	Move Basic program lines.
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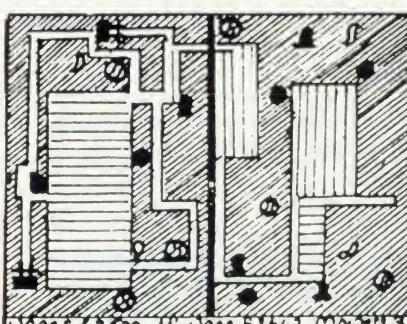
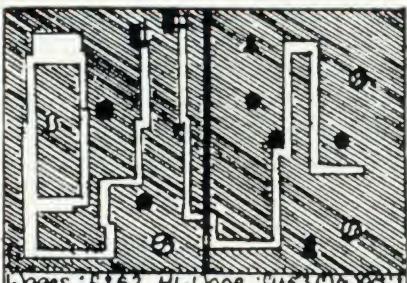
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A highly versatile implementation of Chess. Play black or white against the computer or a human opponent. The skill level of the computer's play can be varied widely, and moves are entered either by co-ordinates, cursor control, or joystick control. Moves can be taken back if an error has been made, and the board can be modified at any time. Games can be "saved" or "loaded", and the last game can be replayed. The computer will, if requested, suggest your moves.  
**NEW RELEASE**



**CENTIBUG**

The centibug descends from the top of the screen weaving intimidatingly between the mushrooms. Your objective is to shoot all the segments of the centibug before it reaches the bottom of the screen. Features include: spiders, snails, flies; 6 skill levels, hi-score, rankings, and increasing difficulty.



**ALIEN DROPOUT**

A novel and unusual program. Arcade-action with this exciting multi-stage shooting game. The objective of the game is to shoot the aliens out of their "boxes" before the "boxes" fill up. Once full, the aliens fly down relentlessly, exploding as they hit the ground. The game features include: 6 skill levels, rankings, hi-score, increasing difficulty.



**STRANDED**

An adventure game using hi-resolution full-colour graphics. You are stranded on a strange planet, and your mission is to return to civilisation and home. Many of the locations are shown graphically, including the spaceship, the cliffs, the mountains, and (if you succeed) your home. You must carefully explore your environment searching for hidden clues to help you in your quest.  
**NEW RELEASE**



**WORLD GEOGRAPHY**

This program covers 166 countries which are divided into 8 categories of difficulty. Each country is pinpointed on an accurate hi-resolution screen map of the world, and the user is asked the capital and/or population. At the end of the test, the percentage of correct answers is given so that the student can monitor his geographical knowledge.

**ALSO AVAILABLE:**

INVADERS	£7.95	DISASSEMBLER	£7.95
FRUIT MACHINE	£7.95	DRAUGHTS	£6.95
CONSTELLATION	£7.95	REVERSI	£6.95

**DEALERS** - Our software is now available at all good dealers including selected branches of W. H. Smith and Boots; all major computer dealers - Microstyle, Electronique, 3D Computers, Computerama, GTM Computers, etc.; and our software is also available through all the major distributors, and directly from us.

**WE PAY UP TO 20% ROYALTIES FOR HIGH QUALITY BBC MICRO AND ELECTRON PROGRAMS.**



**SUPERIOR SOFTWARE LTD.**

Dept. AU8, Regent House,  
Skinner Lane, Leeds 7  
Tel: 0532 459453

**OUR GUARANTEE**

- (1) All our software is available before we advertise.
- (2) All our software is despatched within 48 hours by first-class post.
- (3) In the unlikely event that any of our software fails to load, return your cassette to us and we will immediately send a replacement.



# Watford Electronics

Dept. BBC, CARDIFF ROAD, WATFORD, HERTS. ENGLAND.

Tel: Watford (0923) 40588/37774 Telex: 8956095 WAELEC

ACCESS ORDERS Tel: (0923) 50234

## BBC MICROCOMPUTER

Model A—£260; Model B—£346

### SPECIAL OFFER

For every purchase of BBC Micro during June/July, we will supply a Data Recorder worth £24 absolutely FREE. (At Watford you get a great deal for your money.)

Upgrade your Model A with our Upgrade Kits and save yourself £ s s s

● BBC1 16K Memory (8 x 4816AP-3 100nS)	£24.00
● BBC2 Printer User I/O Port	£8.10
● BBC3 Disc Interface Kit	£99.00
● BBC4 Analogue I/O Kit	£8.25
● BBC6 Expansion Bus Kit	£7.75
● Complete Mod. A to B Upgrade Kit	

## ELECTRON MICRO

£199

## Dust Cover for BBC Micro

Protects your expensive Micro from foreign bodies. £3.50

## SEIKOSHA GP100A PRINTER

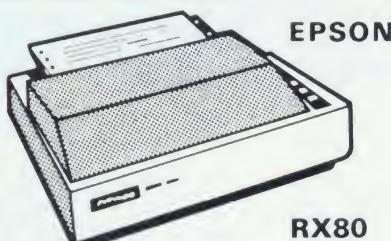
10" Tractor Feed, 80 columns, 50CPS. Normal & Double width Char, Dot res graphics. Parallel Interface standard. SPECIAL OFFER Only: £144 £7 carr.)

## FRICTION FEED

Attachment for GP100A or 250X Printers £28

GP-700 Colour Printer Screen-dump routine in ROM FOR BBC Micro

£12



EPSON

RX80

100 CPS, 9 x 9 matrix, dot addressable graphics, condensed and double width printing. Normal, Italic and Elite Graphics. Tractor feed, 10" max width, bi-directional, logic seeking. Centronics Interface standard.

ONLY £235 (£7 carr.)

## EPSON RX80 F/T PRINTER

As above but has both Friction and Tractor Feed. £259 (£7 carr. Securicor)

## PRINTER INTERFACE BUFFER

Neatly packaged self contained box, supplied complete with all leads, manual and detachable power supply.

Price: 16K Unit £99  
Price: 48K Unit £135

## Epson FX80 Printer

160 CPS, 11 x 9 matrix, proportional spacing, superscripts, subscripts, dot addressable graphics. Normal, Italic and Elite characters. Up to 256 user definable characters. Down loadable character set. Condensed and double width printing. Full proportional spacing. Four user defined margin positions. Tractor and Friction feed. 10" maximum width Bi-directional, logic seeking Centronics interface standard.

ONLY £324 (£7 carr.)

## Epson FX100 Printer

Same as FX80 but has a 15" wide Carriage £495

Type	Ribbons	Dust Covers
MX80FT	£4.75	£4.50
MX100/FX100	£10.00	£5.25
FX80	£4.75	£4.95
RX80	£4.75	£4.50
GP80	£4.50	—
GP100	£4.95	£3.95
GP250	£5.95	£3.95
GP700	£18.50	—
KAGA KP810	£5.95	—

## RX & FX PRINTER INTERFACES

RS232	£35	RS232 + 2K Buffer	£59
IEEE 488	£65	2K Parallel	£58

## BROTHER HR-15

DAISY-WHEEL PRINTER

An exceptionally high quality daisy wheel printer at the price of a dot matrix printer. 18CPS; bi-directional, 3K of buffer; has clear buffer facility, carriage skip movement, proportional spacing; underlining; bold print and shadow print. Prints in two colours; super and subscript facility. Impact control facility to vary pressure on paper for making carbon copies. Has Centronics parallel or RS-232 interface. Connects directly to BBC Micro. A ribbon cassette plus a separate red ribbon. Optional extras: single sheet feeder takes up to 150 A4 sheets; a keyboard that transforms HR15 into a sophisticated electronics typewriter. Attractively finished in beige.

ONLY £349

Single Sheet Feeder	£199
Keyboard	£150
RIBBONS:	Carbon £3; Fabric £3; Multistrike £6

## LISTING PAPER (Plain)

1,000 Sheets 9½" Fanfold Paper	£7
1,000 Sheets 15" Fanfold Paper	£9
Teleprinter Roll (Econo paper)	£4

## PRINTER LABELS (continuous stationery)

1,000 90 x 36mm	£5.50
1,000 90 x 49mm	£7.75
1,000 102 x 36mm	£6.25

Carriage on Printer Paper or Labels £1.50

## BBC Micro WORD-PROCESSING PACKAGE

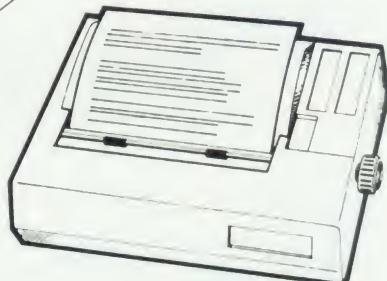
A complete word processing package consisting of: BBC Model B, Zenith 12" Green or Amber Monitor, Twin 200K highly reliable (1 year warranty) Teac Disc Drives in matching beige colour, the popular WORDWISE word processor, Watford's own highly sophisticated 62 File DFS interface fitted, the world renowned Brother HR15 Daisy Wheel Printer, Gemini's Beebleplot & Beebcalc Spreadsheet Analysis Software discs, 10 blank diskettes, 500 sheets of fan-fold paper, Manuals and all the leads. To enable you to carry your Micro around, we shall pack it in our Antique Brown leatherette Attache carrying case.

ONLY £1,249 (carr. £15)

(P.S. We will alter the package to suit your requirement. Call in for a demonstration).

NEW

## KAGA KP810



This new JAPANESE printer has EPSON FX/RX compatible commands. 140 CPS Dot matrix Printer, offers NEAR LETTER QUALITY print in a 23 x 18 dot matrix in addition to the standard Epson style type-faces on the 11x 9 matrix. Friction feed. Adjustable tractor feed. Single sheet feed and built-in Paper Roll Holder. Normal, Italic, Enlarged, Condensed, Super and Subscript. Dot addressable graphics (8, 9 and 1 pin modes). Proportional spacing. (Optional extra Down loadable character set in 8K ROM or RAM). NEAR LETTER QUALITY print, selectable at switch on. 10" maximum width, bi-directional, logic seeking. 3K Buffer. Half speed quiet mode. Convenient Paper-out sensor switch. Centronics Interface standard. All this plus our no quibble 12 months warranty.

Special Introductory Offer: ONLY £269  
RS232 Interface + 2K Buffer

## KAGA KP910 PRINTER

Similar features as the above KP810 printer but has extra wide carriage. Will accept upto 17" maximum width paper. 156 column normal and 265 column condensed.

ONLY: £349

## PRINTER LEAD 36"

Ready made printer lead to interface BBC Micro to EPSON, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA, etc., Printers.

ONLY £

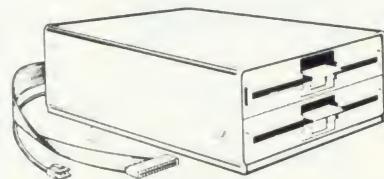
Special Extra long 5 feet Cable

## DISC DRIVES CASED WITH

### CABLES (less PSU)

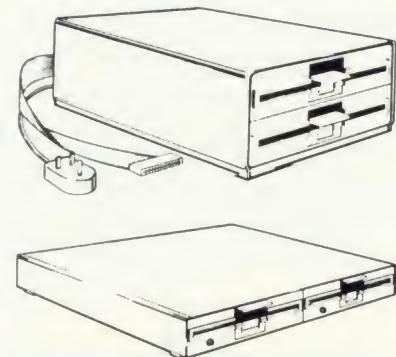
(All Drives are NEW SLIM-LINE Type)

### NEW LOW PRICES



CLS 100 Single, TEC Single sided 40 track 100K, 5½" Disc Drive	£119
CLS400 Single, Mitsubishi Double sided 80 track 400K, 5½" Disc Drive	£179
CLS400S Single, Mitsubishi Double sided 40/80 track Switchable, 400K, 5½" Disc Drive	£215
CLD200 TEC Single sided 40 track 200K, twin 5½" Drives	£245
CLD800 Mitsubishi Double sided 80 track 800K, 5½" TWIN Drives	£359
CLD800S Mitsubishi Double sided 40/80 track switchable, 800K, Drives	£399

### (CUMANA) DRIVES CASED WITH PSU & CABLES



CS100 TEC Single sided 40 track 100K 5½" Single Disc Drive	£143
CS200 TEC Single sided 80 track 200K 5½" Single Disc Drive	£205
CS400 Mitsubishi Double sided 80 track 400K 5½" Single Drive	£225
CS400S Mitsubishi Double sided 40/80 track 400K 5½" Single Drive	£340
CD200 TEC Single sided 40 track 200K 5½" TWIN Disc Drives	£269
CD400 TEC Single sided 40 track 200K 5½" TWIN Disc Drives	£365
CD800 Mitsubishi Double sided 80 track 800K 5½" TWIN Drives	£425
CD800S Mitsubishi Double sided 40/80 track Switchable 800K TWIN Drives	£465
SPARE DRIVE CABLES. SINGLE £6; DUAL £8	
DFS Manual (comprehensive) £7.50 (No VAT)	

P.S.

You do not require Formatting Discs when using our DFS as the formatting program is in the ROM, nor do you require expensive 40/80 track switchable drives as with our DFS you can read and write 40 and 80 track discs in an 80 track drive (software switchable).

2. **MITSUBISHI SLIMLINE DISC DRIVES** that we supply are Double Sided, Double Density 5½", 1 Megabyte. (With BBC Micro 400K after formatting.) When used in conjunction with Double Density board one obtains 800K (approx) after formatting. Track density 96 TPI, track to track access time 3mSec. These drives are very fast, quiet and efficient. We strongly recommend their use.

## 5½" DISKETTES

(Lifetime warranty)

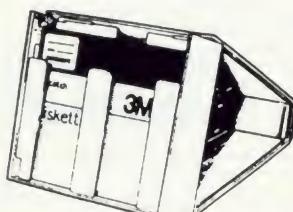
Why settle for less, Buy the best.

- 10 Verbatim or 3M Diskettes S/S D/D £17
- 10 Verbatim or 3M Diskettes D/S D/D £28

## DISC ALBUMS

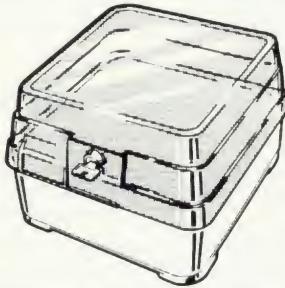
Attractively finished in beige leatherlook vinyl. Stores, protects and displays 20 discs in double-sided clear view pockets. ONLY £4.95

## PLASTIC LIBRARY CASES



for Disc Storage 5½" (holds 10) £2

## LOCKABLE STORAGE UNITS



Attractively finished, strong beige plastic base fitted with dividers. Smoke acrylic top. Supplied with adhesive title strips for ease of filing.

- M-35 Holds upto 35 mini discs £14
- M-85 Holds upto 85 mini discs £18

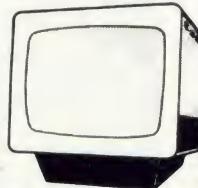
## FLOPPY HEAD CLEANER KIT

Unless your office/home is dust free, you should clean heads at least once a week to avoid the risk of cross contamination.

Simply apply the cleaner to one of the specially formulated cleaning discs, insert into the drive and initialise. If your system has no initialisation program then insert the disc and open and close the door 5 times.

£16.00

## MONITORS



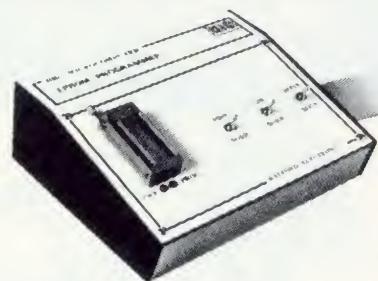
### MICROVITEC 1431

14" Colour Monitor, RGB Input (as used in BBC programmes) FREE Interface Lead. Special Offer £174

- **MICROVITEC 1451** Hi-res 14" Monitor incl. lead £295
- **NEW MICROVITEC 14"** Colour Monitor/Composite Video £249
- **KAGA RGB 12"** Medium Resolution Colour £195
- **KAGA 12"** High Resolution Colour £259
- **KAGA 12"** Standard resolution colour MONITOR/COMPOSITE VIDEO ONLY £195
- **BNC Connecting Lead** £3
- **RGB Connecting Lead** £5
- **ZENITH 12"** High resolution, jitter free picture, Amber or Green £75

Carriage on Monitors £7 (Securicor)

## EPROM PROGRAMMER



At last! — the EPROM Programmer for BBC Micro Computer from WATFORD ELECTRONICS that will suit both your pocket and all your requirements. Programs all popular types of EPROMS from 2K bytes up to 16K bytes — **2716 — 2516 — 2532 — 2564 — 2764 — 27128**. Our Programmer has been designed to make sure the EPROMs are neither programmed too fast nor too slow; just at the right speed as recommended by the manufacturers of the EPROMs (any deviation in timings can burn their brains out).

This extremely powerful system is designed for your needs of TODAY & TOMORROW! — BBC Basic programs can be copied into EPROM and subsequently re-loaded faster than from a disc! Suitable for both hobbyist and professional users!

Just look at these features:

- **COMPLETELY SELF CONTAINED** — Housed in its own sturdy case — Uses its own power supply — Connects directly to the 1MHz Bus — Simple and Safe!
- **FULL SOFTWARE SUPPORT** — Comes complete with simple to use fully machine code ROM based software and easy to understand manual. Facilities include Verification, Reading, Virgin Testing, Writing, Editing, Saving, Loading and more! NOTE!! — This software does not simply comprise hastily prepared routines to get you going, but is a professional, purpose designed applications package.
- **ACORN BUS COMPATIBLE** — Use of the 1MHz connection complies with all Acorn addressing recommendations — That means you can still add-on such things as the TELETEXT, IEEE 488 TUBE and PRESTEL
- Allows more than one program to reside in an EPROM using the ROM Filing System.

ONLY £89 incl. Manual (£3 Carr.)

## TEX EPROM ERASERS

EPROMs need careful treatment to survive their expected lifetime. Rushing it could burn their brains out. So cop-out of this helter-skelter world; take it easy the TEX way and give your chips a well earned break. Cool, gentle and affordable. EPROMPT does it properly.

Two versions available:

- **EPROMPT EB** — The standard version. Erases up to 16 chips. £30.00
- **EPROMPT GT** — Erases up to 28 chips. Has an incorporated safety switch which automatically switches off the UV lamp when the Eraser is opened. £33.00  
Spare 'UV' Lamp bulbs £9

## SWIVEL MONITOR BASE



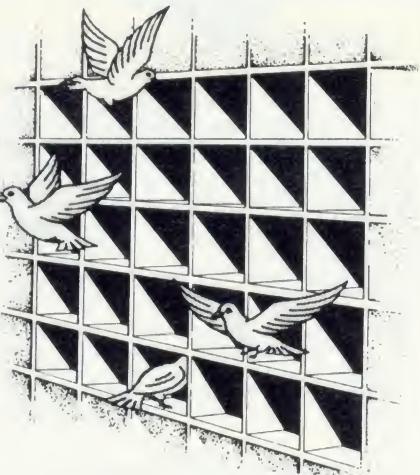
Attractively finished in beige, our swivel base allows you to tilt/swivel your Monitor to any required angle for comfortable viewing.

ONLY £18

Continued →

# WONDERFUL WATFORD

## TWO DATABASE SOFTWARE for BBC MICRO



### DISCDATA

At last for BBC Micro Disc users, Watford Electronics have produced 'DISCDATA' which must be the most versatile general database at the price on the market. The length of your files is restricted only by the space on your disc. You can have up to 20 fields with 'page' length records of up to 254 characters. The program is completely menu driven obviating reference to a manual although written guidance is given with the program. Add and delete records, amend title, field names and records, sort on any field and search for any record or group of records in any field. You do not need to abandon or rewrite your files if you wish to add additional fields or extend the length of any field, the program will rewrite the files for you. Your files can be in any drive. Output can be in 40, 80 or 132 character width with Printer routines. Two forms of output are provided for horizontal for label type output and a tabulated output with title and headings. What is more, the selected fields can be placed in any order on the screen. In the horizontal mode you can scan backwards or forwards with wrap around effect. Output can be started or stopped anywhere in the file. There is automatic totalling on decimal fields and an automatic count of the number of records output. Now with extra 3 features: Allows string search; Calculations can be done on numeric fields; Create Sub-Files from the main File.

On disc at

**Only £15**

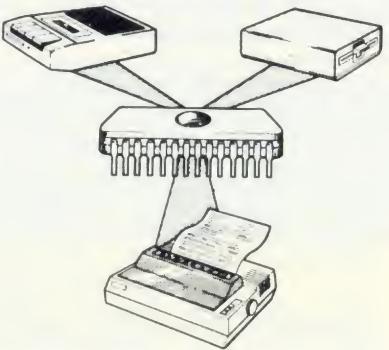
It has to be the best value.

### FILE-PLUS

Now even more powerful with the added facility of a SHELL SORT on any field. This must make DATA-PLUS the most powerful and versatile Database to be found on BBC Micro. A 16K ROM containing the most flexible and easy to use disk based Database system on the market. A database may occupy your total on-line storage capacity. You may design any number of data entry forms using a "paint" on screen technique. Forms may be up to 3 screens in size. A form may be used to Add, Delete, Update, Print and Spool records from your Database. Quick search facility on any text field. A query language provides full maths support (-, +, /, \*, =, >, <, <=, >=, &, !) when used with the keywords - Assign, Compare, Display, End, Goto, If, Ift, Print, Read, Search, Spool and Update. Full printed output control via embedded commands. Supplied with 70 page manual and fitting instructions.

**Only £43**

### BUFFER & BACKUP ROM



A very versatile firmware. An ideal ROM for engineers, programmers, teachers, students, etc.

- ★ Converts your Sideways RAM to a 4K or 16K BUFFER for a parallel printer. (Uses \*FX5,3). (You no longer require to purchase expensive (£100+) Printer Buffers.)
- ★ Dumps selection of Disc files to Tape.
- ★ Makes backup copies of tapes onto Tape, Disc and Hobbit.
- ★ Displays contents of a chosen paged ROM on screen.
- ★ Menu display on 'shift-break' using ROM Filing System.
- ★ Comprehensive Manual

Simply a give away at **£18**

In keeping with our tradition of bringing you the best in BBC Micro at prices you cannot refuse, we are launching yet another of our ROM based software.

### NEW LAUNCH ROM MANAGER

This unique piece of firmware has been designed to allow the USER to access the BBC Micro's Sideways Rom Paging facility to the full. The 18 Commands our ROM MANAGER adds to your computer are concerned with 3 aspects of ROM use:

1. ROM CONTROL – Ability to activate at random any of the ROMs present in the Micro.
  2. BBC MICRO'S STATUS – e.g. Checksum on any ROM, and the Filing system currently active.
  3. ROM DEVELOPMENT – Allows main memory to be used like Sideways RAM.
- The Commands available are:
- \*CHECKSUM – generates a CRC for the specified ROM.
  - \*DIRECT – allows you to pass a particular command to the specified ROM.
  - \*EXAMINE – allows examination of the named ROM.
  - \*EXPLAIN – gives detailed description of the first 22 FX codes.
  - \*FILE – passes the command directly to the currently selected filing system.
  - \*FUNCTION – displays the string currently programmed onto the function keys.
  - \*INCLUDE – allows the main memory to be used for developing ROM software without need to purchase expensive sideways RAM.
  - \*MODIFY – any location in memory is displayed and can be modified with this command.
  - \*NAMES – displays the names of any resident ROMs.
  - \*RAM – allows the command to be passed directly to the RAM based ROM.
  - \*REMOVE – turns off the RAM based ROM option.
  - \*SPECIFY and \*DEFAULT – specifies the default ROM and passes the named command to the default ROM specified.
  - \*STOP and \*START – allows the named ROM to be disabled or enabled, preventing clashes between ROMs.
  - \*STATUS – provides information about the ROMs inside the BBC micro, including the socket number, the name of the ROM, its length, whether or not it is enabled and supports language or service entry points.
  - \*VALUES – outputs information concerning the status of ROM MANAGER e.g. the socket number it occupies, the number of active ROMs with a higher priority than itself, the current filing system.
  - \*VECTOR – the same function as \*DIRECT, but provided in case \*DIRECT clashes with other ROMs.

In our opinion this ROM is one of the most useful utility ROMs available on the market, and is a must for anyone using ROM based software.

Introductory Price: Only £19

### GEMINI'S BUSINESS SOFTWARE

Cashbook Accounts	£52.50
Final Accounts	£52.50
Invoices & Statements	£17.25
Commercial Accounts	£17.25
Mailing List	£17.25
Database	£17.25
Stock Control	£17.25
Home Accounts	£17.25
Beebcalc Spreadsheet Analysis	£17.25
Beebplot	£17.25
Payroll	£39.00

N.B. All the above Gemini software is on tape. For Disc Based (40/80 track) please add £3.

### VERSATILE LIGHT PEN SOFTWARE

- Enjoy, Explore, Educate!
- Pixil, Line, Character Definition
- Free hand drawing
- All Colours – MANY Special Effects
- Fill, Refill and Stripes
- User defined "Brushed Strokes" plus Character definer
- Grid, Scale, Perspective aids
- 2 TO 200 Points palletable in one Design with Circles and "RUBBER BANDING"
- Move design/character to any screen position
- Save and Load screens, User defined Graphics and line drawings for video titles, Own programmes, etc.
- Many Educational uses
- Instruction booklet included
- Full software support for "CUSTOM USE"
- Works with Watford, RH, Acorn User, DIY, and many other LIGHT PENS
- Available on DISC or TAPE

Price: Tape £10; Disc £11

### DISC EXECUTOR

Disc Executor is a highly sophisticated disc utility which allows you to transfer all tape based software that we know of onto disc. You no longer have to throw away any of your cassette based software on acquiring a disc drive. It handles 'locked' programs and allows you to load full length adventure type programs (i.e. up to 6E blocks) and programs that load below & E00. It is very simple to operate (full instructions supplied). It saves you your valuable time and money too. Our Disc executor is not a Replica, it's the 'Real Thing'. Available in both 40 and 80 track discs. Please specify when ordering.

Price: £10

### ADE

The complete program development package on 16K ROM. A must for all the Assembly Language Programmers.

Introductory price: Only: £52

### GAMES SOFTWARE

CHESS	£6.95
CROACKER	£6.95
Escape from MOONBASE ALPHA	£6.95
CHUCKIE EGG	£7.90
FELIX in the FACTORY	£6.95
GALACTIC COMMANDER	£6.95
KILLER GORILLA	£6.95
MUNCHYMAN	£5.95
MOONRAIDER	£6.95
MUSIC SYNTHESISER	£8.25
PENGOW (Watford)	£7.75
SWOOP	£6.95
Twin Kingdom Valley	£8.25
747 FLIGHT SIMULATOR	£7.75

### LEVEL 9 ADVENTURE GAMES

COLOSSAL ADVENTURE. The classical mainframe game "Adventure" with all the original puzzles plus 70 extra rooms.

£8.65

ADVENTURE QUEST. Through forest, mountains, desert, caves, water, fire, moorland and swamp on an epic quest vs tyranny.

£8.50

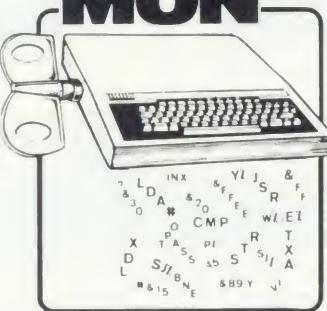
DUNGEON ADVENTURE. Over 100 puzzles in the Demon Lord's dungeons.

£8.50

SNOWBALL. Save a 7000 location colony starship in 2302 AD.

£8.50

# BEEB MON



Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler mnemonics.

use as a debugging tool, you run code under total emulation system. Ever felt a desperate urge to set a break point in ROM? No problem you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from here DFS and other sideways ROMs can be used in total emulation mode.

Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist as a virtual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being executed at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

**£22**

## Disassembler Rom



Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use programmers tool.

ROM based machine code Disassembler for the BBC micro. It enables machine code programs to be listed in BASIC/DUMP format and thus is the perfect complement to the built in assembler. It allows Sideways ROMs, files on tape or disk to be listed, and also has a comprehensive editor, allowing mnemonics to be entered directly, as well as HEX, DECIMAL, ASCII and BINARY memory editing. There is also a full set of labelling facilities available (up to 3,200 labels), with the major locations and routines already labelled.

DIS-ASM enables any monitor program, such as BEEBMON to be used to much greater effect as it is not necessary to disassemble memory each time the display is altered.

**ONLY £16**

(This includes a comprehensive manual and operating instructions.)

## Computer Concept's

Graphics ROM **£27**

## CARETAKER

The New Basic Utility ROM from Computer Concept **£28**

**DISC DOCTOR** **£26**

A sophisticated Disc Utility ROM with many useful commands. (For detail description please refer to Computer Concept's advert in this magazine.)

## Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

**SPECIAL OFFER THIS MONTH: £32**

## THE INVESTIGATOR

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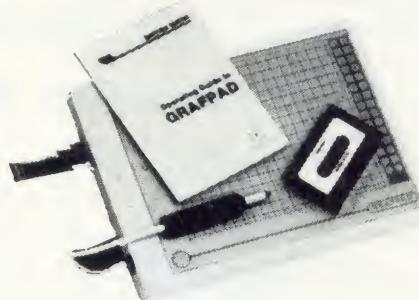
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R=0 3> Dump rotation 0, 90, 180, 270 degrees.

Indent > Set gap from left edge of paper. X< min > max > Y< min > max >. The area of the screen dumped is that in the graphics window; alternatively these parameters may be given.

P Physical colour values used for dumping, otherwise use a negative scale; i.e. white prints darkest).

T Two tone dumps for higher resolution. M mask > 8 bits controlling colour masking. E Contrast expansion. Makes mode 7 text characters and separated graphics stand out more clearly from the background.

C All mode 7 graphics printed as reduced size dumps.

\*GWINDOW Draws graphic window on screen, its size and position can then be altered using the cursor keys.

\*TIMAGE > indent > Does a fast, text only dump of the text window in any mode.

\*TWINDOW As GWINDOW but for text.

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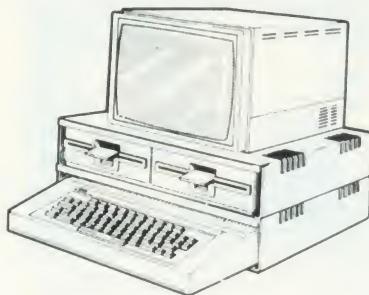
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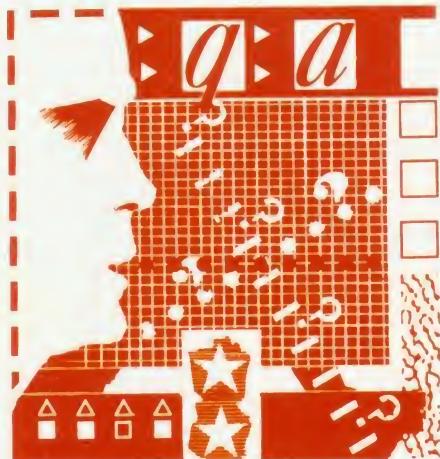
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**Testing****the keyboard**

HERE is a question that is straightforward enough but the answer leads on to an exploration of some features of BBC Basic that I know confuse many. David Cameron of Bradford understands what INKEY does followed by a positive number in the brackets, but asks for help with the negative INKEY statement. The subject is something the handbook does not explain fully. It is actually quite easy when you know how, but, as is usual with the BBC (and of course the Electron), there's usually a great deal more hidden round the corner!

INKEY (X) where X is a negative number enables you to see whether a particular key is pressed at that instant. This is most useful as it is possible not only to test those keys that have an ASCII number associated with them, such as the numbers or the letters of the alphabet, but it also allows the programmer to test for keys such as the copy key or the shift key which have no ASCII code.

As always, the best way to see how it works is to try a few examples. Listing 1 (see page ii) uses a REPEAT...UNTIL loop to keep testing the keyboard and ends when the space bar is pressed; -99 is the number for the space bar. A full list is given in both the Electron and BBC user guides. What the user guides do not mention is that if the appropriate key is detected, a value of -1 will be stored in A, and a value of 0 if the key is not detected. Those who intend writing programs on their BBC for the Electron beware! Some of the negative INKEYs do not exist on the Electron. The Electron has no TAB key, no SHIFT LOCK, and negative INKEY cannot be used to detect the Electron's function keys. Neither can the following be detected in this way on the Electron: ^, \, @, [, ].

When listing 1 is run, if several keys are pressed before the space bar is pressed the string of characters will be printed when the program ends. To avoid this, include line 80:

## Martin Phillips dispels negative INKEY confusion, presents a vertical printing method, and nurses his Beeb back to health

80 \*FX15,0

This will clear the keyboard buffer, where key presses are stored temporarily before being processed by the computer. Listing 2 is a rearranged version of listing 1. This saves having to use a variable (A) and saves a line of typing, and hence some memory space.

Listing 3 shows how INKEY works with a positive number in the brackets. The positive number represents the number of centiseconds (hundredths of seconds) the statement will wait for a keyboard response. In the case of listing 3 it will wait three seconds. If no response is made in the time allowed, a value of -1 is returned in the variable A. If a key is pressed, then the ASCII number of that character is returned. There is a list of ASCII numbers in both user guides. These are not the same values as the negative INKEY numbers (couldn't be that easy). The ASCII number for the space is 32. Using INKEY in this way is a useful way of creating a pause in a program.

Listing 4 shows another variation on the 'testing the keyboard for the space bar' theme. This program uses the GET statement, which will halt the program until a key is pressed. Listing 5 is very similar, except that GET\$ is used. GET returns an ASCII number corresponding to the key that was pressed, GET\$ returns the ASCII character itself.

Finally, listings 6 and 7 are procedures to print a message at the bottom of the screen in reverse text and wait until the space bar is pressed. Two versions are needed, one for modes 1 and 4 and the other for modes 2 and 5. A third version would also be needed for mode 0, but has not been included here. The reason for the different versions is the differing size of print between the modes. The long strings of VDU codes in listing 6 have the following meaning:

VDU 24,175;10;1100;60; Define a graphics window at the bottom of the screen.

VDU 5 Join the text and graphics cursors.

VDU 18,0,131 Define graphics colour (GCOL0,131). In this case the background colour. White in modes 1, 4 and 5, yellow in mode 2.

VDU 12 Clear the graphics window to the colour just defined.

VDU 18,0,0, Define black as the text colour.

VDU 18,0,128 Set background colour back to black.

VDU 18,0,3 Set text colour to be white in modes 1, 4 and 5, and yellow in mode 2.

VDU 16 Clear graphics area.

VDU 4 Separate text and graphics cursors.

VDU 26 Restore default windows.

Lines 10030 and 10040 need not be two separate lines. They were split to make the procedure more readable.

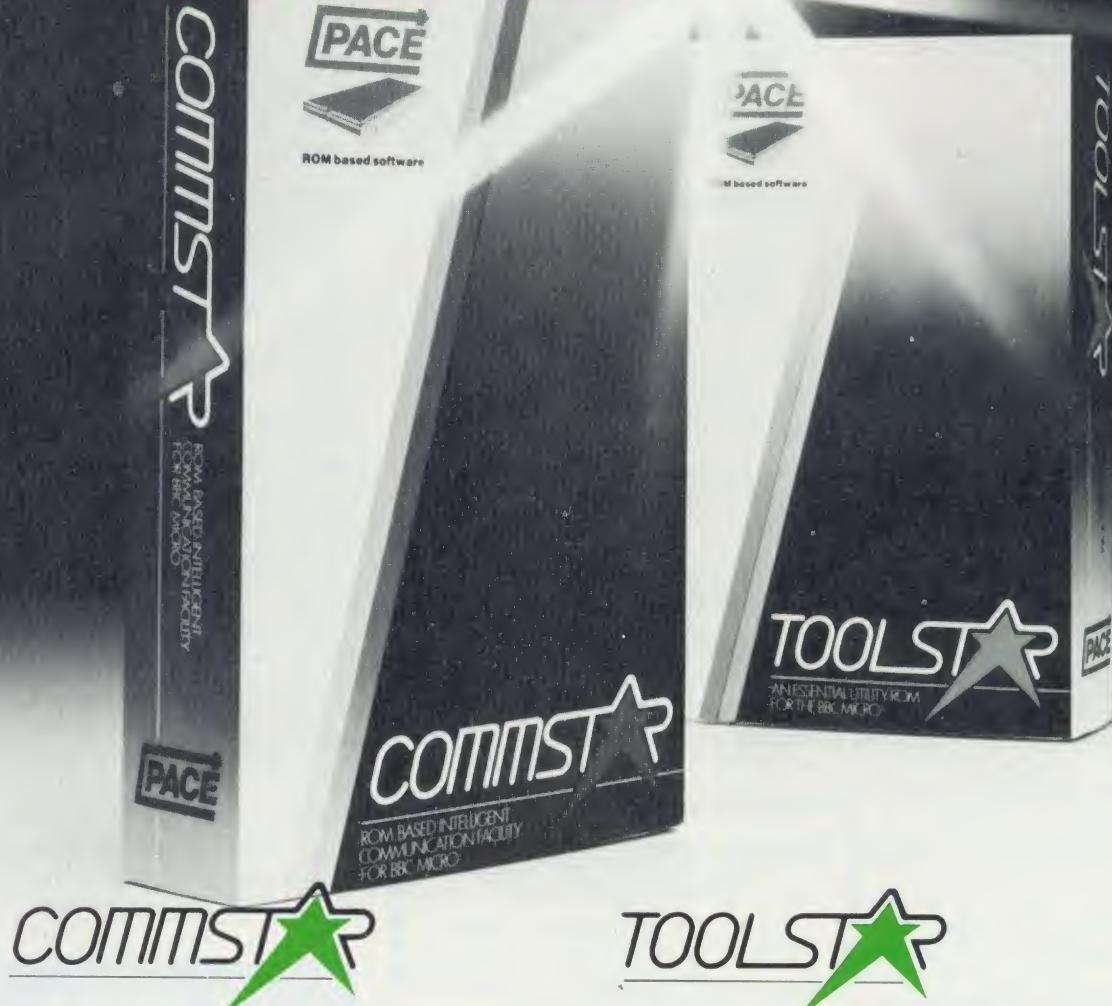
**To rewind or****not to rewind**

BOB BARRETT of Belfast says he was horrified to read my advice about not rewinding cassette tapes after use (*Acorn User*, February). This, he says, could lead to cassette tapes becoming slack and then when re-used winding themselves round the cassette mechanism and being destroyed.

I stand by my advice. The problem of tape winding itself around the spindle of the cassette recorder is much reduced with the use of short-length computer tapes. In fact I can't remember it happening, although it often happens with the long C90 audio tapes. My main reasons for suggesting that the tape is not rewound is that I have

**IF YOU** have a technical hitch or a programming problem let Martin Phillips give his diagnosis. We'll pay £5 if you raise a really interesting point. Please give full details of the system you're using and include a listing where appropriate, making your question as specific as possible. WRITE TO: Hints & Tips, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

# A STAR IS BORN



#### PRESTEL, MICRONET, BBC to BBC file transfer, Terminal Emulation.

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How many times have you wanted to get a copy of a program to a friend or a business colleague, quickly? With Commstar you can transfer a file of ANY type, between two BBC's (which may be thousands of miles apart), in the space of a phone call. It really is that simple!

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#### Terminal Mode

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Commstar allows full configuration and easy control over the protocols used. Send and receive baud rates, word length, parity and number of stop bits are selected from a simple table of options.

When in chat mode (80 or 40 column), characters transmitted by the host will be displayed on the BBC screen and characters typed on the BBC will be sent to the host.

Commstar allows ANY type of file (not just ASCII) to be transferred 'safely' using XMODEM protocols. In fact four individual methods of transmission are provided for within Commstar giving great flexibility.

Using a disk based emulation file, Commstar can be configured to emulate virtually any terminal type including VT100, within the capabilities of the BBC.

In addition to the above, most MOS commands can be executed from within Commstar, errors are trapped by Commstar's own error handling routines and an optional elapsed time clock may be displayed. Data filter, Local Echo, Auto-line-feed, printer on/off and XON/XOFF protocols may be toggled in or out by a single key press, extensive use being made of the function keys.

Finally, Commstar may be fitted into any of the sideways ROM sockets and is provided with a comprehensive manual.

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This package contains the Toolstar firmware in Eprom and a very comprehensive manual (over 150 pages), containing many examples and illustrations to help you make the best use of Toolstar's exciting capabilities.

#### Toolstar sheds new light on your BBC micro

Toolstar, being Eprom-based will be permanently resident in your computer allowing all of its commands to be immediately available. It is 'transparent' to both the user and the operating system, once a command has been executed, control is returned to Basic, or whichever ROM had control prior to the command.

Full error handling has been incorporated and for new users there are full help menus describing each command and its syntax.

#### Powerful building blocks for Basic programmers?

Within Toolstar there are 22 commands, 8 of which operate between PAGE and TOP ie. on the current Basic program or Basic programming environment. These commands obey standard Basic command syntax rules.

#### Reveal the deepest secrets of your discs

Toolstar allows the operations of Formatting, Verifying, reading or writing a disc sector to be carried out very simply from Basic i.e. all the necessary building blocks required to develop a comprehensive set of disc utilities, simply and effectively.

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In addition to the commands described above there are 9 commands which operate on the whole of the BBC's memory and are designed to complement the BBC's built in assembler. These include a full feature disassembler and memory dump, each with forward and reverse scrolling.

#### If that's not enough Toolstar can be Extended!

There are three help menus on Toolstar which may be obtained by typing HELP TOOLS, "HELP MCODE" or "HELP EXTEND". The third option menu will initially display the following:

"HELP EXTEND"

EXTEND - RAM adds

i.e. typing "EXTEND - address" will allow the user to extend the facilities of Toolstar with routines which are supplied by himself. The manual describes fully how this operation is carried out and illustrates it with several examples.

In the future such utilities will be made available on disc and cassette from Pace, thus allowing a comprehensive library of utility programs to be built up.

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frequently seen inexperienced users rewinding the tape by pulling out the connecting lead to make the cassette motor work. This quickly destroys the cassette lead and/or cassette socket. In any case with many programs it is not easy to stop the program, use the \*MOTOR command and rewind the cassette. Not rewinding cassettes has caused no problems for me, but I always use C12 or C15 tapes. Also, if a backup copy is made of tapes, it is cheaper to risk the occasional loss of a cassette than to keep replacing cassette leads.

Mr Barrett also bemoans the fact that there was no \*FX command to alter the inter-block gap on cassette files. Acorn in fact allows this to be changed, not using a \*FX command but the \*OPT3 command. The inter-block gap can be altered from 0.1 to 12.7 seconds on loading. The default value (the value normally set by the computer) is 2.5 seconds. It is not possible to change the inter-block gap using a \*OPT or \*FX call when saving data files. The \*OPT command is mentioned on page 398 of the user guide.

## Tape loading

### problems

Mr PROVAN of Glasgow has been writing programs on his computer, saving them on tape and then trying to load them on another computer without success. Even using the same cassette player he gets block and data errors. The only way he can transfer programs at 1200 baud is to make a tape copy using a twin tape copier and use that.

The fact that a program loads after it has been copied on a stereo copier suggests that the fault lies in the different record or playback levels expected by each computer. Several circuit changes were made to the cassette interface on early and not-so-early BBCs.

This is a problem for the dealer to sort out. It might be necessary to take both computers in to find which (or both) is incorrect. The dealer should be aware of the changes made on the earlier computers and should be able to modify yours and bring it up to the latest standard.

## A window on printing

J SUMMERS asks for a way of printing text vertically on the screen. There are

several methods, most relying on taking each letter in turn (this can be done using the MID\$ statement) and printing it vertically using the TAB statement, or by using VDU5 to join the text and graphics cursors and then using the MOVE statement to position each letter. There is another, not very obvious, way that is much easier. You define a text window one character wide and print the word inside the window. Each letter will appear under the previous one. The text window can be cancelled using VDU26.

Listing 8 draws two axes and labels each one to show the technique. It will work on both the Electron and the BBC. Line 100 has been inserted to move the prompt and the cursor out of the way when the program ends. The left-hand edge and the right-hand edge of the window have the same value.

On the subject of text windows, I have had several comments from readers unable to define text windows in mode 7 on the BBC. The problem, I suspect, is that the window has been defined too large, so that the window simply defaults to the whole screen. Mode 7 has only 25 lines in common with modes 3 and 6, as opposed to 32 with the other modes. Remember too that it starts at line 0 and ends at line 24, and the first character is positioned at column 0 and the last character at column 39. This has caught me out several times!

A text window one or two characters wide can be defined to have some of the mode 7 control codes embedded. Then if a window is defined as the size of the rest of the screen, the screen can be cleared or scrolled without affecting the control codes.

For some useful effects, try listings 9 to 14. Reference will need to be made to the section on mode 7 control codes in the user guide.

```
10 REM Listing 8
20 MODE 1
30 MOVE 100,1000
40 DRAW 100,100
50 DRAW 1200,100
60 VDU28,0,10,0,1
70 PRINT"Vertical"
80 VDU26
90 PRINTTAB(28,31)
    "Horizontal";
100 PRINTTAB(0,30)
```

Listing 8. Demonstrates technique of printing a character within a text window

Listing 9 shows how a title can be placed at the top of the screen and remain there while the rest of the screen scrolls. This effect will work in other modes too, although the double-height facility cannot be used.

## My computer

### loses its spark

FOR the past two months, writing this feature has been very difficult, and my faith in the Beeb has been shaken. My trusty computer has started letting me down. The troubles started shortly after I fitted a couple of new ROMs onto my sideways ROM board. By now it is beginning to get rather full. When I was using Wordwise the computer suddenly developed a creative spirit of its own and started adding words, phrases and characters here and there.

I found a cure by taking the top cover off the computer. Ah, overheating! I hear wise readers thinking - but no, Listings 9-14 (see also overleaf). Useful effects with text windows in mode 7

```
10 REM listing 9
20 MODE 7
30 FOR N=0 TO 24
40 PRINTTAB(0,N)CHR$(131;
50 NEXT N
60 VDU28,1,24,39,0
70 FOR N=1 TO 10
80 PRINT"HELLO"
90 NEXT N
```

```
10 REM listing 10
20 MODE 7
30 FOR N=0 TO 24
40 PRINTTAB(0,N)CHR$(130+N MOD 2);
50 NEXT N
60 VDU28,1,24,39,0
70 FOR N=1 TO 10
80 PRINT"HELLO"
90 NEXT N
```

```
10 REM listing 11
20 MODE 7
30 FOR N=0 TO 24
40 PRINTTAB(0,N)CHR$(129+N MOD 7);
50 NEXT N
60 VDU28,1,24,39,0
70 FOR N=1 TO 10
80 PRINT"HELLO"
90 NEXT N
```

```
10 REM listing 12
20 MODE 7
30 FOR N=0 TO 24
40 PRINTTAB(0,N)CHR$134CHR$141;
50 NEXT N
60 VDU28,2,24,39,0
70 FOR N=1 TO 10
80 PRINT"HELLO"
90 NEXT N
```

```
10 REM listing 13
20 MODE 7
30 FOR N=0 TO 24
40 PRINTTAB(0,N)CHR$129 CHR$157 CHR$132;
50 NEXT N
60 VDU28,3,24,39,0
70 FOR N=1 TO 10
80 PRINT"HELLO"
90 NEXT N
```

```
10 REM Listing 14
20 MODE7
30 FOR N=1 TO 2
40 PRINTTAB(9,N)CHR$141CHR$130;
50 PRINT"EVERLASTING TITLE!"
60 NEXT N
70 VDU28,0,24,39,4
80 REPEAT
90 PRINT'"The title will remain even though"
100 PRINT'"the rest of the screen will scroll"
110 I=INKEY(100)
120 UNTIL 0
```

this fault was there when the computer was first switched on. I thought the trouble was a broken track on the keyboard circuit board because it happened only when I touched certain keys. After much eyestrain I gave up that avenue of thought and concentrated on the sideways ROM board. I wondered if it was, as Joe Telford had found, that the board was not sufficiently buffered and that adding the extra couple of ROMs had caused the fault. I removed these ROMs and a couple more for good measure but the fault was still there, although not so bad. Back to the drawing board.

By then the fault was getting worse. Listings would not print out, odd error messages appeared, programs corrupted for no reason, and even the disc drive refused to work at times. I got my multimeter out and started measuring voltages here and there. I was surprised to find that the output from the power supply was low, 4.80v when it should have been 5v. I checked the power supply connectors on the circuit board. Lo and behold, several of the spade connectors had dry joints where they were soldered to the board. I

resoldered them, the voltage increased to 4.86v and the fault was cured – for a week.

Stronger measures were called for. I committed the sacrilege of soldering the power supply leads directly to the board. The voltage on the board rose to 4.91v, and again the fault disappeared, this time for a couple of hours, but when the computer warmed up the fault reappeared. I went the multimeter probes again, recording voltage on the sideways ROM down to 4.75v. This needed a drastic remedy. I cut off the two pins that carry the power supply from ROM socket to sideways ROM board, wired the power supply direct to the ROM board and added a small electrolytic capacitor. Voltage 4.9v. This cure seems to have worked and my confidence in my trusty Beeb is returning.

If this was the real fault, then it is probably not just buffering problems on the sideways boards but also low supply voltage caused by drawing too much current down tracks never designed to carry such current. This will affect most boards similarly as they become more populated, or as the ROM socket into which they plug works

loose. Also it appears that the fast-on power lead connectors will cause trouble as the computer ages, and soldering might be a cure. However, this is not a tip for the beginner or the newcomer to soldering. It could cause a lot of expensive damage. If in doubt take it to a dealer.

## Loading

### machine code

R P LANE of Chippenham was trying to copy a machine code program onto his BBC micro in the way shown in April's Hints & Tips. All went well until near the end of the program, when the screen started filling up with odd signs and characters.

What happened was that the free memory space in the computer was full and the program continued loading, overwriting the screen area of memory. Assuming the program will load and run on a BBC, I would guess that Mr Lane has got a computer with disc interface or Econet interface. When either or both of these are fitted they reserve some memory for their own use, leaving less for the user. If Mr Lane tried to load a long program in there would not be enough room.

All is not lost. If you are not using disc or Econet the memory space reserved for either of these filing systems can be recovered and used for other purposes. To do this type PAGE=&E00 and press RETURN. This restores the memory as though you had a tape-based computer. Many programs on cassette check to see if PAGE is different, and change it back again so that when running the program it will load and run without problem.

Some cassette programs that do not check the value of PAGE will not load on machines with disc or Econet fitted and again will work only if PAGE is altered as above. PAGE is the position in memory where a program is to start loading. By altering PAGE it is possible to load two or more programs into the computer (provided they are reasonably short) and quickly switch from one to the other. For example, type PAGE=&E00 and enter a short program and check that it runs (one or two lines is sufficient to play with). Now type PAGE=&E00 and type in another short program and run that. Return to the original PAGE by typing PAGE=&E00 and you should be able to run the original program. On returning to PAGE=&E00 you will still find your second program in residence and this can also be run again.



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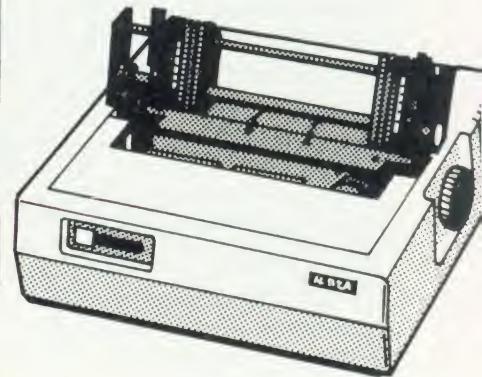
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# ELECTRON-LEARNER

60

Tessie Revivis starts off our new regular 'welcome pack' section

**S**O YOU'VE just opened your Electron box. Great—but what next? Yes, you've taken delivery of the lovely micro you've heard so much about. And there's a funny-looking plug, a black lead of sorts, an introductory cassette and a big book. A quick flick through this *User Guide* looks a bit daunting, with all those diagrams, and you see lots of numbers—and you're no good at maths!

Here's some sound advice from the *Hitchhiker's Guide to the Galaxy*: don't panic! The *User Guide* may look daunting at first sight, but it really is easy to understand, and you don't even need to know the answer to 2+2 to read it or program your Electron.

Before getting started, make a bit of room for yourself, preferably on a table with a couple of mains sockets within a few feet of you. You'll also need to commandeer the television set. A spare portable set is preferable, otherwise you'll have to use the family telly, but be diplomatic and let the rest of the family finish watching *Dynasty* first. You'll need to be polite about it because you'll want to use it again in the future. It doesn't matter whether the set is black and white or colour. Colour is nicer to view but black and white performs just as well.

Take your Elk (that's its nickname by the way) from its polystyrene casing. It's light but pretty robust (try not to drop it, though). Place it on the table with the keyboard facing you. This looks very much like a typewriter keyboard, but it has a few extra keys, some of which have odd-looking symbols on them, but we don't need to worry about these yet.

Lay your hands on the keyboard and try pressing a few keys at random. You'll find that you don't have to apply much pressure to depress them. The great thing about programming a computer like the Elk, though, is that you don't have to be a typist.

Look either side of the casing. On the left you'll see four largish round

sockets and on the other side of the case a single small socket. On the underside of the case, directly beneath the set of four sockets you'll see the words 'UHF TV', 'VIDEO', 'RGB' and 'CASSETTE'. These each relate to the function of the socket above. Note the position of the one marked UHF TV—we'll need to connect the TV to this one.

Place the computer in front of the TV set, which should be switched off. To connect the TV to the Elk you'll need the thick black lead supplied. Remove the aerial connection from the TV and plug one end of the black lead into the empty aerial socket. Which end? Well, only one end will fit. The free end can now be plugged into the UHF TV socket that we identified earlier.

Next, we need to connect the Elk to the mains through that odd-looking plug called a power supply. The small round plug at the end of the wire fits into the small single socket on the right-hand side of the Elk. Push the plug end of the power supply into the mains socket and switch on. You should hear a small bleep from the Elk and a small light should be visible on the left-hand side of the keyboard just below the key marked ESCAPE.

Plug the TV in to the mains and

Above—Power supply lead and Electron-to-television lead. Below—Electron keyboard with 'micro on' indicator light below the ESCAPE key

switch it on. You'll probably see a poor quality picture of the channel it is presently tuned to. The volume control of the TV can be turned right down, as we don't need sound. To see the picture produced by the Elk the TV must be tuned into the computer's channel. If you have a dial-type channel selector rotate this to about the 35 point; adjust it carefully about this point and you should find the Elk's picture. If your set has a push-button or infra-red channel control you'll need to program one of the buttons. Refer to your TV manual to do this. Again, the channel needs to be set to 35 or 36 and fine-tuned.

Now you're ready to start programming! No, sitting in close proximity to the TV can't give you radiation poisoning, as several old wives' tales suggest. I've been sitting in front of mine for the last year and I've still got three arms! It's a good idea, though, to take a break every half-hour or so to give your eyes a rest.

Try typing a handful of letters on the keyboard. As you press a key it will be displayed on the TV screen. Now press the key marked RETURN, located on the right-hand side of the keyboard. This acts like the typist's carriage return bar, but it also informs the computer that you've finished entering the line and you want it to have a look at what you've typed in. You'll probably





Sideways views of the Electron showing (left) sockets for TV, video monitor, RGB monitor and cassette, and (right) power supply

see the word 'Mistake' displayed. The Elk printed this on the screen because it could not act on what you typed in – it was not a valid command.

To get rid of what you typed, push the key marked BREAK at the top right-hand side of the keyboard. Don't be afraid to hit this if you need to wipe the screen clear, you'll do no harm. Try it again and press BREAK a few times.

Type the following in:

VDU7

pressing the keys V,D,U and 7 in that sequence. Now press the RETURN key to 'enter' the letters into the Elk. Did you hear a bleep? If so, you have just entered your first command into the Electron using BBC Basic. This command simply told the Elk to play a short note on its own speaker.

Let's now enter our first program. Type the following in exactly as it appears:

```
10 MODE 5
20 MOVE 1000,0
30 PLOT 85,1000,500
40 VDU 7
```

Remember to press the RETURN key at the end of each line to enter it into the computer. Don't worry about making a mistake – you can't hurt the computer. If you make a mistake simply press the RETURN key and retype the line.

Notice that each line of the program begins with a number. These line-numbers serve the important function of telling the computer the order in which to enter the program into its memory system. Low line numbers come before high line numbers.

Interspersed between the line numbers and each command, and in the middle of some of the commands, are spaces, entered by pressing the space bar on the keyboard, the long key at the bottom. The reason for entering these spaces is to make the program neat and readable. You could leave them out altogether or insert two, or three or more spaces instead of one.

To see the effect of this program we need to tell the Elk to execute each instruction. This is called running the program. Type in the word RUN and press the RETURN key. Voilà! You should now see a large white triangle

drawn on the lower half of the screen – and did you hear the beep?

To clear the screen press the BREAK key, as before. To get our short program back we must enter two commands. To remind the computer it has a program in its memory (it does forget sometimes) type OLD and then press the RETURN key. The Elk now recalls the program you entered and will print it on the screen if you type LIST (remember to press the RETURN key). You can now run the program again if you wish.

You might want to re-type it without the spaces to see if they do have any effect on the way the programs operate.

Now you might feel more ready to tackle the *User Guide* and work through the many examples it contains. Start at the beginning and don't skip sections that look a bit overpowering. Programming isn't particularly hard if you try each item out. Try experimenting by changing each program slightly. You won't harm the computer and you can always stop things by pressing the BREAK key.

## CONVERTING BEEB PROGRAMS TO RUN ON THE ELECTRON

**W**HY aren't there more programs for the Electron in *Acorn User*? It's nearly all for the BBC. The Atom gets good coverage. So why not the Electron? This is one of the questions that readers constantly ask *Acorn User*. The fact is that in an average issue perhaps about 75 per cent of the so-called Beeb material will also run on the Electron with little or no conversion. So let's see how all you Elkies can go about the B to E conversion where it needs to be done.

First, it's worth making a list of the main differences between the two

machines so that problem areas can be established. They are:

- No Mode 7 and teletext graphics on Electron.
- No 6845 cathode ray tube controller chip on Electron.
- Only one SOUND channel on Electron.
- Operating system calls.
- No hardware for 'direct' interfacing on Electron.

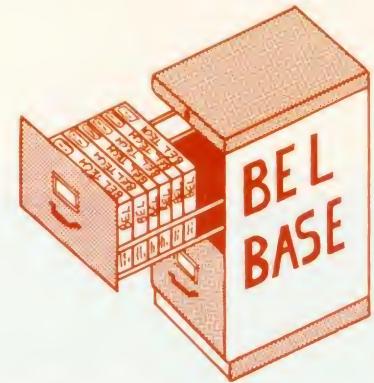
In most instances the first item on our list will be the only real reason for program surgery.

Look at the program you want to convert. Does it include the command MODE 7? Remember this is the default mode for the Beeb so that even if no mode is specified an initial CLS will have the same effect. Unless the program is specifically about teletext (and is therefore unconvertible), this mode is probably being used to take advantage of double-height and flashing characters for titling purposes. Transferring these into mode 6 should be straightforward. Colour can be achieved effectively using the COLOUR command.

page 63 ►

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If the program uses mode 7 it will almost certainly include teletext control codes, which will normally be in the guise of CHR\$ commands. For example, the lines:

```
150 PRINT CHR$ (141): CHR$ (129):  
    "Acorn User"  
160 PRINT CHR$ (141): CHR$ (129):  
    "Acorn User"
```

would print *Acorn User* in red double-height characters on the Beeb's screen. The double-height facility is not directly available on the Elk but could be implemented using the user defined characters. Printing in red is readily performed using COLOUR 1. Figure 1 lists all the teletext control codes that you are likely to encounter.

The fact that we are using the Electron's mode 6 has another side-effect. It uses 6k of memory, as opposed to the 1k required by the Beeb's mode 7. If the program is purely textual, say an adventure game, we have to squeeze it into a smaller memory. For converting programs from *Acorn User* this problem should not arise as listings this long are not normally published in the magazine. However, inefficient programming can drastically increase the amount of workspace below HIMEM required by the program. Consider the Basic lines:

```
10 REPEAT  
20 x$=x$+"£"  
30 y$=y$+"+"
```

```
40 UNTIL LEN x$=255
```

The program occupies about 50 bytes but, believe it or not, when run it will require more than 7700 bytes of memory to operate! If running a program ever results in a 'No room' error have a good look through it for this sort of inefficiency.

The Beeb's graphics are handled in a different way from the Elk's. On the Beeb they are controlled by a specialist chip, the 6845 CRTC (cathode ray tube controller), plus a video ULA to provide the colour palette. The 6845 is a memory-mapped device and it is possible to program its registers to achieve rather stunning effects, such as instantaneous screen scrolling, left, right, up or down! The 6845 is not incorporated into the Elk. Instead a ULA chip designed specifically for the Electron combines the BBC's two chips, but it lacks programmability. In other words sideways scrolling is not instantly available.

There is no reason why you should not write your own procedures to perform these functions, but they really need to be in machine code, and even then they would not have the instantaneous effect of the 'hardware' scroll-

ing. For details on the 6845 see the April issue, page 26. To aid your conversion, figure 2 helps you identify the commands the Beeb uses to access the 6845.

SOUND and ENVELOPE are both scaled down on the Elk. Four sound channels are incorporated but the micro can drive only one channel at a time. This means you can't synchronise notes on the Elk using the '&' prefix, eg, SOUND&201, -15,20,20.

The Envelope command considers only the first eight parameters; the remaining six are ignored. In general there's no reason to make changes to these commands when converting a program, but don't expect a concerto written for the Beeb to adapt readily.

Most of the operating system commands specific to the Beeb's 1.2 MOS have been implemented in the Electron's MOS. However, there are differences between them, although so far Acorn has not released a comprehensive list. Obviously OS calls that refer to items such as analogue to digital converters or the RS423 serial interface are less likely to have been implemented than others. In most instances OS commands will be directly transferable.

Hardware-specific programs will not, of course, run on a bare Electron, but most of the hardware specific commands are implemented in the Electron's Basic - ADVAL, for example.

Because of the Electron's popularity an increasing number of peripherals are becoming available. Sir Computers has been offering a printer and joystick interface for several months and Acorn's own Plus 1 (see the news section in this issue) will be available within a month or two (fingers crossed!). Decide on your printer by reading the reviews by George Hill that have appeared in *Acorn User* over the last year, then take advantage of all of the utilities he has provided.

So, as you can see, it should in many instances be a painless task to do the B to E conversion. A look into the May issue, for example, reveals that the following three programs will run directly

on the Electron with no conversion: *Doodle Bug*, page 83; *The Fantastic Four*, page 96; and *Circles, Diamonds and Squares*, page viii.

*Heaven's Date* (page iii) will run, though you would probably want to convert lines 30 to 100 to look tidy on a mode 6 screen. Similarly, Joe Telford's *Sober Statistician* can be converted to run on a tape-based system as he suggests, and with mode 7 to mode 6 conversion it should perform admirably.

CHR\$ (129)	: Alphanumeric red
CHR\$ (130)	: Alphanumeric green
CHR\$ (131)	: Alphanumeric yellow
CHR\$ (132)	: Alphanumeric blue
CHR\$ (133)	: Alphanumeric magenta
CHR\$ (134)	: Alphanumeric cyan
CHR\$ (135)	: Alphanumeric white
CHR\$ (136)	: Flashing text
CHR\$ (137)	: Steady (non-flashing) characters
CHR\$ (140)	: Normal-height characters
CHR\$ (141)	: Double-height characters
CHR\$ (145)	: Red teletext graphics
CHR\$ (146)	: Green teletext graphics
CHR\$ (147)	: Yellow teletext graphics
CHR\$ (148)	: Blue teletext graphics
CHR\$ (149)	: Magenta teletext graphics
CHR\$ (150)	: Cyan teletext graphics
CHR\$ (151)	: White teletext graphics
CHR\$ (152)	: Conceal display
CHR\$ (153)	: Contiguous graphics
CHR\$ (154)	: Separated graphics
CHR\$ (156)	: Black background
CHR\$ (157)	: New background
CHR\$ (158)	: Hold graphics
CHR\$ (159)	: Release graphics

Figure 1. Teletext control codes

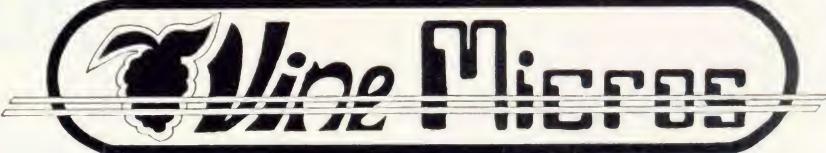
```
VDU 23,0,R,X,0,0,0,0,0  
where R = Register  
and X = Value to be written to 6845  
&FE00 = Address register  
&FE01 = Register file
```

```
*FX 151,0,Y = Write Y to address register  
*FX 151,1,Y = Write Y to register file
```

Figure 2. 6845 CRTC programming commands



Don't be fooled, these really are BASIC commands, and they can of course use any BASIC variable or expression, be situated in multi-statement lines, be used in line-entry mode, and in fact anywhere or anytime that the standard BBC BASIC commands can be used. No other sideways-ROM offers such facilities, they use 'star commands' that cannot match the ease of use of ADDCOMM's commands.



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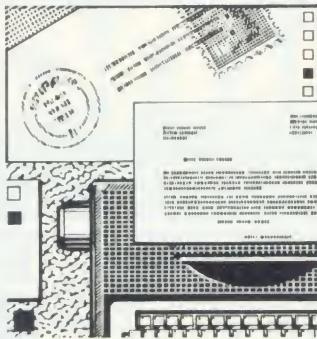
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## How Joe

### missed the point

Sir, The idea of a statistics package, as started by Joe Telford in your May 1984 issue, is welcome.

Joe wants to see whether data confirm Bill's hypothesis that in darts games 'men were scoring less on each throw when playing a lady opponent'. He finds the correlation coefficient,  $r$ , showing a moderately high correlation of +0.829, apparently proving Bill's theory. Unfortunately Joe used an inappropriate technique. The correlation doesn't reflect differences between the two measurements in a pair, but only whether they tend to go up or down together in a particular way. Joe shows that for the following four pairs of numbers,  $r=1$ , the biggest it can possibly be:

	X	Y
item a	1	4
item b	2	5
item c	3	6
item d	4	7

If the four items were four men dart players, and X and Y their average scores against lady and men players respectively, it does indeed look as if Bill's hypothesis is supported. But the correlation coefficient would also be 1 with the following results:

	X	Y
item a	1	1
item b	2	2
item c	3	3
item d	4	4

which certainly don't lend credence to Bill's idea.

Commonsense, we should look at the differences, average score vs men - average score vs ladies, for each player. Out of eight players, seven scored more against men, which is already evidence favouring Bill. The mean excess of score vs men over score vs ladies is 8.6, with standard error 1.8; this is very strong evidence that Bill is correct.

But of course, as Joe says:

'... A more important question is how valid was the actual data.' For a start, the fact that the two types of opponents are referred to as 'men' and 'ladies', the one not being the natural opposite of the other, leads the reader to suspect that something more than skill at darts is being compared! I hope Joe enjoyed collecting the data.

Wendy Fox  
London

### Horrors of statistics

Sir, In your May issue Joe Telford constructed a statistical package for testing the hypothesis that male dart players score less when playing a lady than they do against a male opponent. Now, Joe is a talented chap; his programming skills will already be well-known to your readers but here we find he is also a meticulous field worker in this important area of social research. Unfortunately, all expertise has limits. His breezy adage 'Get the data right and the rest is easy' suggests a serious underestimation of the horrors of statistics. Accordingly, the data were analysed in quite the wrong way for testing his hypothesis.

Each dartsman furnished a pair of scores: a score against lady opponents and a score against other men. With eight players, we had two sets of eight figures to compare. Joe performed a correlation on these data, claiming that the closer the resulting correlation coefficient is to +1 the closer he would be to proving the chauvinistic hypothesis.

Perhaps the easiest way to see that this won't do is to imagine an outcome in which each player happened to score exactly the same in his two games - doing just as well (or badly) against ladies as he did against men. Obviously, the original hypothesis must be wrong here, but it is in just this case that the correlation is perfect at  $r = +1$ . Correlations consider relations between pairs of scores but not the particular relation Joe is after. Scores are 'correlated' across conditions (ie, different opponents) when individuals maintain their relative standing within the whole group. So the high positive correlation for these data means only that the high

scorers against men were also the high scorers against ladies. This is useful information about the consistency of players when judged against each other - it says nothing about the effect of different game conditions on the absolute level of scoring. Nevertheless, I am pleased to say that application of the appropriate test, Students 't', reveals support for the hypothesis.

The rest is still not 'easy', even when we have got the data right and got the analysis right. We must still interpret our findings. I have discussed these results with some of my colleagues and have aroused considerable interest. As Joe is based just down the road from us, perhaps he would be interested in some collaborative research combining expertise. There is a large group of people here unusually anxious to go out and collect more data. I can't understand it.

Dr Charles Crook  
Psychology Department  
University of Durham

We've passed your letter on to Mr Jottings, who will, we're sure, do a statistical analysis on it down at the P&G.

### Deep joy

Sir, I recently bought the new Acornsoft Aviator program and must say that it is one of the most impressive simulations around, providing hours of enjoyment.

The program is best appreciated by using a joystick. To my home-brewed joystick I've added a further touch of realism by extending the stick with a two-foot length of plastic pipe half an inch wide and on the end I've mounted a plastic grip like one from a bicycle handle. On the top of this is a small push button wired to the push button on the joystick handset.

When mounted on the floor between your feet the whole thing is a unique experience.

Chocks away!

A Katz  
Edgware,  
Middlesex

### Looking good

Sir, I patiently awaited my May copy of *Acorn User*, which I have only just been able to obtain because it appears to have been published much later than usual. May I say that the new-look magazine is a vast improvement. I am also very glad that we shall be able to obtain tapes of the programs published. I hope that you will be able to topple the other monthly magazine 'Micro User' from its ABC pedestal!

J G Manley  
Rochester, Kent

'Acorn User' should be available in your newsagent on the third Thursday of the month preceding the cover date. For example, this issue came out on the third Thursday of June, ie June 21.

### At last, a new

### wave of games

Sir, A few weeks ago I was seriously considering writing a letter to your magazine in which I was going to complain about the amount and quality of software for the BBC micro. We constantly read articles about 'the fantastic BBC computer' and its 'excellent sound and graphics facilities', and when the BBC was first released Acornsoft provided ten to 20 high-quality programs, most of which were pure arcade copies. But then they sat back and left it at that, and other software houses seemed to follow their lead and not produce any better-than-average programs for six to 12 months. What I want to ask the software houses is, Where are the *Manic Miners* and the *Atic Atacs* of the BBC?

The letter I intended to send was all written out when I received April's issue of *Acorn User*. Upon opening it I found that Acornsoft had released a flight simulator, *Aviator*, Program Power had just released *Ghouls* and *Jet Power Jack* and Superior Software had

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brought out *Battletank* and *Overdrive*, so it seems that somebody else had noticed the lack of good, new software for the Beeb and had pressed the software houses to get underway again. I wait pensively for the reviews of these new additions.

The letter from 'A Pirate' forced me to comment that software houses are cutting their own throats by charging high prices for their software. If the prices were lower when the software was first released, people would not have the same incentive to copy software, but if prices are dropped now, the pirates will merely take advantage of making even cheaper copies of programs.

I read with great interest the article on the 6502 second processor, and would like to know when the other second processors are to be released. Also, do you know of any plans to release a 32-bit second processor?

**David Edmondson**  
Whitworth, Lancs

No doubt by now you've read all about the Z80 in the June issue (page 26). This is, in theory, already available, although your dealer may not stock it until Acorn has cleared its order list. A 32-bit second processor is being planned but no release date has been fixed yet.

## Steadier for the Star

Sir, With reference to George Hill's ingenious mode 7 screen dump program (*Acorn User*, March), owners of Star printers have undoubtedly found the hard copy produced by this program to be distinctly 'wobbly'. I discovered that the simple and effective remedy is to insert the control code 'ESC 85,1' (in the form VDU1, 27, 1, 85, 1, 1) at line 195. This turns off the Star's bi-directional printing and so results in a much neater and more regular printout (two examples enclosed).

It's a good idea to re-enable the bi-directional printing just before the end of the program, with a 'VDU 1, 27, 1, 85, 1, 0' at line 335.

Keep the great magazine going!  
**David C Sheasby**  
W Midlands

## Getting the error

### codes right

Sir, In the May edition of *Acorn User* you published a letter from Mr P Hinchliffe at the end of which he made a call for a complete list of error codes and messages. Having looked into this recently I submit the following information that may be of use to him.

To quote the *Advanced User Guide*: 'The BRK instruction forces an interrupt which is interpreted by the operating system as an error. As part of the error handling in Basic the programmer can incorporate an error number and an error message into his code to identify the error. The byte in memory following the BRK instruction should contain the error number. The error message string should follow the error number and must be terminated by a zero byte'.

As the error number is a single byte it is true that there are 256 possible errors and messages. However, Basic uses only 44 and these are listed in the *User Guide* on page 482. 'At line xyz' is not an error, merely additional information that is appended to the error message using the variable ERL to indicate the line in which the error occurred. Furthermore, error number 60 does not exist.

The operating system uses 15 error codes, but not all of these are listed in the *User Guide*. The following nine are not included and in addition I can find no trace of error numbers 217 (header?) and 220 (syntax).

Error number	Message
213	Locked
214	File not found
215	Bad ROM
247	OS 1.20
249	Language?
250	Key in use

251	Bad key
252	Bad address
253	Bad string
254	Bad command

There are three errors with code 0, though I am not sure whether they are valid errors. Their messages are:

Silly  
Remember space  
Line space

As indicated by code 247, the OS error numbers and messages refer to OS 1.20.

**David Abbot**  
Horsham, Sussex

## Seriously...

Sir, I would like to criticise your magazine for not reviewing utility programs and ROMs. Your magazine is full of charts and reviews of the most useless games, but this is not useful to serious programmers.

I have a copy of MASS by DDT Software and have been using it for two months. For anybody writing serious machine code it is one of the most useful utility ROMs available. It is a powerful and flexible assembler which brings a quantum leap to machine code programming on the BBC micro.

I hope other readers get the opportunity to judge for themselves by way of a review, soon.

**Roddy Maddocks**  
Brighton

We like nothing more than to please, so we hope the ADE ROM review on page 137 is up your street.

## Confessions of a

### tape copier

Sir, For the last few months I have been reading the letters concerning software piracy with a great deal of interest.

CEEFAX 153 Wed 11 Apr 13:04/01  
**Weather Eye**



Scotland, N Ireland,  
N Wales and N England  
will have showers and  
sunny periods.

The rest of England and  
Wales will have a little  
rain at first, becoming  
brighter and mainly dry  
with clear periods  
overnight.

Temperatures: Normal in  
south, cold in north.

A neater print-out on Star, by David Sheasby

One thing I have noticed is that some people think that every pirate copy of a program means £9.95 less for the software company. This is not a true conception.

I have certain pirate programs in my collection that have been lent to me by other people (and 99 per cent of software users have copies in their collection, as well they know it). I borrow a tape, copy it and return the original but that does not in any way mean that I have conned the software house out of any money. Indeed, of the programs I have copied I would not have purchased at least 95 per cent.

The fact is that too much software of poor quality is being produced with too much clever advertising. Ten pounds for one game is far too much and so many games turn out to be dead boring anyway.

In fact, there are programs of a fair quality around, but it is virtually impossible to tell which is good and which is run-of-the-mill rubbish.

While we are on the subject, your magazine doesn't help the matter by publishing a classified free ad page. For a start, every ad that says 'swap' means, I imagine, swapping copied software.

No, I am not a hardened pirate yet, and I have as many original programs as pirate copies. One third of the programs I have paid for I don't like at all, one third I put up with and the rest I like—the same applies for copies.

It is time software companies made their prices realistic (Acornsoft especially), provided software on disc and not just on tape, stopped lying about their games—and magazines stopped publishing ads from pirates who use the cover of swappers.

By the way, I think your magazine is the only BBC magazine to provide any true professional journalism, and the new layout and format is much better (my old *Acorn User* magazines always fell apart).

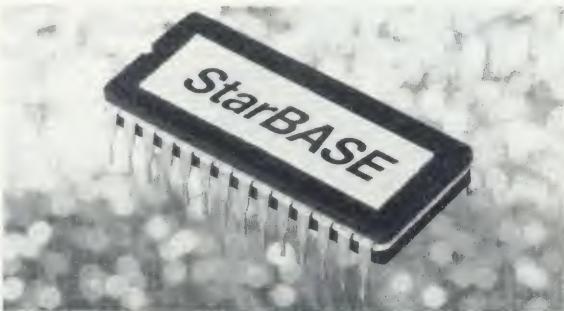
**B McBain**  
Wisborough Green, W Sussex

## 'Proper'

## management

Sir, With reference to your article 'Database Menu Grows' (page 10, *Acorn User*, May) please be advised that my *proper* database manage-

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ment system has been on the market since before January.

I say proper because it enables the user to create a whole scheme involving up to 20 or 30 files, which are inter-related. Each file can contain approximately 1800 records and each record 20 fields in up to 512 bytes.

The software (which includes a lot more than the above) is supplied on 80 track disc, with a full manual for £60.

**P S Horner**  
Simon Computer Services  
York

## Legal lists

Sir, I would like to correct a comment in the article about the Data Protection Bill (May edition, page 16).

The writer states that there is no clause excluding home computers. This is not entirely correct as section 33(1) makes specific mention of domestic and other limited use but goes on to qualify the section with sub-sections a,b and sections 33(2-6).

Home computers are used for many purposes, membership mailing lists for local clubs among them. But if sections 33(2,3) of the Bill become law, it appears to make holding such a list illegal unless the members of the club have been asked individually if they do not object to the information being kept in this way.

In addition, the definition of 'data' as given in section 1(2) could be made, with a stretch of the imagination, to fit Addressograph-type cards which can be put through an automatic label-printing machine, as nowhere in the Bill is the word 'electronic' mentioned!

'Cobbled together' certainly seems to sum up the Bill and if home computer users are not to be caught up in this bureaucracy then some representation should be made to the Home Office to strengthen the existing clause on exclusion of home computer users. Alternatively, leave section 33(1) as it is, alter section 33(2) by deleting the first line, and delete sections 33(3-6).

So, home computer users, get hold of a copy of the Bill (Bill 159, ISBN 0 10 315984 3), digest it and write to your Member of Parliament.

**D S Buckley**  
Harrow,  
Middlesex

Need help to find  
your way round  
the computer scene?

Kitty advises you

**Q** I am writing to you for unbiased advice as a total computer novice, and also for assessment of educational software. Living overseas, I have no access to a helpful club or organisation, and I am uncertain as to whom I should address my queries; I don't know of any general or educational computer advisory services in the UK but I am sure they must exist.

We bought, some time ago, a BBC model B computer and it remains virtually unused. We only have the *User Guide* and some magazines to guide us, and we really do not understand it at all.

Please could you recommend a good beginner's guide to computing? I have absolutely no prior knowledge of the subject; I want my computer to be a useful, approachable tool—I will never become a computer fanatic. I want it to enable me to quickly make a start in simple programming and to learn by correcting and expanding them as I go on. It will need to be clearly explained, in detail.

I have seen cassettes for sale which claim to debug programs. Do they work? What, if any, software would you recommend me to buy, to use over the year ahead?

My most urgent requirement is for a large file storage system. Which of all the data storage programs are, firstly, absolutely without errors, and secondly, give me the greatest storage space? Unless, of course, you can recommend me such a simple book that I can write my own program!

In addition to my own needs, my four-year-old son would love to learn to use the computer, and I am unable to guide him. Can you suggest material to teach such a young child about computing? I will be buying material to last a full year.

As a primary teacher, I want to encourage him to learn about computers and also to help his academic progress. Can you recommend any quality, published material, prefer-



ably written by educationalists experienced in teaching this age group, relevant to the needs of early primary children. I am not interested in computerised toy 'sums' and 'spelling' games that have been on the market for several years.

In detail, I am looking for material which covers some of the following concepts, or anything else which is suitable:

Early recognition of numerals and understanding of numbers (ie, 9=9) and that a given number, re-ordered, still totals the given number, obviously leading to addition, but I do not want 'sums' as such. Matching, one-to-one (ie, one cup to one saucer). Anything that encourages logical thought applicable to a 4/5 year old.

Pre-reading material. Left to right orientation (games that make the eye or finger follow across the screen from L to R, and subsequently to form a second line directly under the first). Also hand control/letter formation. Any material available which gives a child patterns or letter shapes to trace over on the screen, giving a reward for accuracy.

Early reading. I really want him to be just learning letter sounds, not names, in the lower, not upper case form.

I apologise for asking you so many questions, and I hope you will be able to answer at least some of them. I feel very out of touch with the computer world and what is going on in the UK.

**Jennifer Booth**  
Abu Dhabi

**A** Where to start? First, clubs and advisory services. Try writing to some of the BBC user groups listed in previous issues; some of them will be happy to answer queries by post (they may have a joining fee, however). Groups that are specifically educational are

MUSE, Freepost, Bromsgrove, Worcs B62 7BR; and the MEP, Cheviot House, Coach Lane Campus, Newcastle-upon-Tyne NE7 7XA.

There are several sound books that will introduce you to your BBC and to Basic. I recommend *BBC Basic for Beginners* by David Smith, published by Melbourne House, Melbourne House Castle, Yora House, Castle Yard, Richmond, Surrey TW10 6TS; *Easy Programming for the BBC Micro* by Eric Deeson, published by Shiva, 64 Welsh Row, Nantwich, Cheshire; and *Step-by-Step Programming for the BBC Micro* (books 1 and 2) by Ian Graham, published by Dorling & Kindersley, 1-2 Henrietta Street, London WC2. However, the only way to learn how to write programs is by typing in examples, boring though this is.

Debugging cassettes work only if you understand how to debug anyway—I don't think any of these products would be worth your while, at present.

Now on to databases. You ask about a 'large' storage system. Unless you have disc drives, no storage system can be large; using a database on a cassette system is also extremely time-consuming. You don't say what use you will be putting the database to, but I've found the following to be reliable: *Factfile*, published by Cambridge University Press, Cambridge; and *Masterfile*, by Beebugsoft, PO Box 50, St Albans, Herts. Why not write to these companies and ask what literature they have available?

As for educational software, there are two companies you could write to for their software lists. The first is Bourne Educational Software (BES), Bourne House, The Hundred, Romsey, Hampshire SO5 8BY; the second is ASK, whose products are distributed by Acornsoft, Betjeman House, 104 Hills Road, Cambridge CB2 1LQ. I do feel, though, that learning by computer is no substitute for learning from a person. Also, the best way for a child to learn about computers and computing is just by using a micro.

If you are interested in a fairly simple word processor for your own use, I would recommend *Wordwise* by Computer Concepts—it is very user-friendly and if you get on with it you can then graduate to more complicated WP software. Computer Concepts' address is 16 Wayside, Chipperfield, Herts WD4 9JJ.

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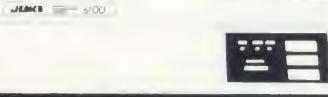
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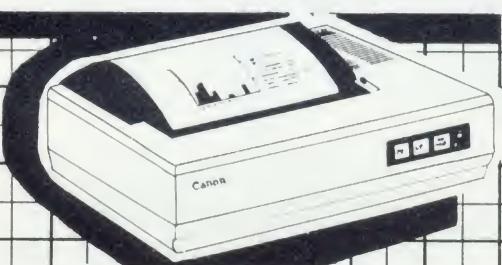


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## How to sort out your

### Basic confusion

AN EVENING'S computing at a friend's house recently brought out some interesting 'problems' that Beeb users all over the country have encountered over the last six months. I'd taken some utility programs with me on disc, but they just wouldn't run correctly, throwing up all sorts of error messages. Back at home, though, the same programs functioned correctly.

It was only after some severe head scratching that (somewhat more sober) I realised I had been trying to run programs written in Basic II on a Beeb fitted with Basic I. While Basic I programs work with Basic II, the reverse is not the case, and the differences are not always as obvious as in the much-publicised commands OPENUP and OSCLI and the EQU functions. For example, the following program will produce a syntax error when run on Basic I.

```
10 INPUT FIRST$, SECOND%; THIRD
```

The offender here would be the semicolon, for only commas are allowed as delimiters in the Basic I INPUT statement. Replacing the semicolon with a comma solves the problem – a subtle difference, you'll agree.

A bit of investigation has resolved more of these naughty quirks. Here they are:

COUNT is a function used to hold the number of characters that have been printed across the screen. In Basic I it is unaffected by a mode change, but in Basic II it is zeroed by a mode change. The program:

```
10 PRINT "Acorn";
20 MODE 4
30 PRINT "User";
40 PRINT COUNT
```

would produce 9 in Basic I and 4 in Basic II, thus discrepancies in text formatting could occur.

Bruce Smith starts you off with advice on the Basic differences. Help from readers covers angled printing, Forth and the WP chips

75

The INSTR function is another command that can lead to a downfall. In Basic I the second string had to be shorter than the first for it to perform correctly, thus:

```
100 PRINT INSTR ("Lydia", "d")
```

would return 3, but the following will not work:

```
100 PRINT INSTR ("d", "Lydia")
```

Performing the latter in Basic II will result in INSTR returning the value of 0.

In Basic II the ELSE test can be used successfully inside functions or procedures as part of an ON...GOTO...ELSE or ON...GOSUB...ELSE structure, thus:

```
500 DEF PROC_Commander
      (branch%)
510 ON branch% GOTO 520, 530, 540
      ELSE GOTO 550
520 PRINT "A":ENDPROC
530 PRINT "B":ENDPROC
540 PRINT "C":ENDPROC
550 PRINT "Failed!":error% = 0:
      ENDPROC
```

would not work in Basic I.

The EVAL statement is particularly useful for using the lexical analyser to evaluate expressions. This has been extended in Basic II to allow it to be used in conjunction with Basic's various pseudo-variables:

```
100 time$ = "TIME"
110 page$ = "PAGE"
120 himem$ = "HIMEM"
130 PRINT EVAL (time$)
140 PRINT EVAL (page$)
150 PRINT EVAL (himem$)
```

This is not possible in Basic I.

Basic II programs that manipulate strings can run out of memory, resulting in a 'No room' error when used with Basic I. This is because the allocation for string space in Basic II is more efficient than in Basic I. Amazingly, the following lines run in Basic I would eat up more than 3.75k of memory com-

pared to around 0.25k in Basic II:

```
10 REPEAT
20 X$ = X$ + "!""
30 UNTIL LEN (X$) = 255
```

The ABS command has been recoded to allow the unary minus to take the absolute value of an integer value without bit 31 set. Therefore:

```
PRINT - ABS(1)
```

will work in Basic II but will return the error message 'Type mismatch' in Basic I.

The mnemonic assembler can be thrown into an acute state of confusion in Basic I if a line such as:

```
140 LDA ASC":"
```

is used. Though this is assembled correctly by Basic II. The Basic II assembler will now also display its disgust with a 'Bad DIM' error if you try the following:

```
100 DIM P% - 2
```

These points should prove useful in converting Basic II programs to run on a Beeb with Basic I fitted. We'll pay a fiver for any relevant Basic II to I conversion tips we publish.

## One of the seven

### deadly sins

ANDY CROWHURST of Portishead, Bristol, writes: 'In Beeb Forum recently you have devoted pages to auto-running Basic programs. Come off it, the word RUN obviously makes the interpreter jump to an address. Therefore \*saving the program at this address will enable a Basic program to be \*RUN. The syntax for Basic I is therefore

\*SAVE "PROG" <PAGE>
<TOP +1> BD2C

page 77▶

**Beeb Forum** is a platform for ideas, tips and applications relating to the BBC micro and the Electron, intended for experienced programmers to share their thoughts. For every reader's tip published we pay £5 – or more for something special. Contributions should be typed or printed, with substantial listings on cassette. WRITE TO Beeb Forum, Acorn User, Redwood Publishing, London WC2E 9JH.

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This program can then be \*RUN much more simply.'

This method does work but try the program on Basic II. It will load but not run. The Beeb has been provided with a very sophisticated set of operating system calls that if used correctly will allow programs written on any version of Basic to run on any other version of Basic. While jumping directly into the interpreter works it is not transferable and should be considered as one of the seven deadly sins on the Beeb (can anyone think of the other six?). We receive many programs that contain this type of illegal call into the interpreter and MOS, and this makes them unusable.

### Machine code

#### auto-run

PHIL COLLET of Banbury adds to the Basic program auto-run saga by providing a piece of machine code that will auto-run a Basic program when it is loaded and also when Break or even CTRL-BREAK are hit. It therefore has advantages over the normal \*KEY10 method of programming the Break key.

The program (program 1, page viii) works by placing OLD <RETURN>, RUN <RETURN> into the REM statement of line 10, which initially contains 49 Xs. Lines 30 to 80 use the operating system to write to the Break intercept code and re-vector it to point to the REM-based machine code.

To use the program enter it as shown and then run it. Next delete all lines after line 60 and add or spool the Basic program onto the end of it. When complete save the lot with

```
*SAVE "NAME" <PAGE>
    <TOP+1> <PAGE+6>
```

On a disc system the program can be chained using \*NAME and on a tape system \*RUN"NAME".

A safety valve can be built in to allow CTRL-BREAK to work by adding a line with \*FX247,0. The Escape key can be disabled with \*FX200,1.

Finally, Phil Collet has a plea to Beeb owners to provide a means of recovering strings and string arrays after a Break. £10 from the Editor's wallet for the best solution.

### Eccentric solution

#### to string problem

CAMBRIDGE reader Philip Hazel writes:

There are a number of other approaches to J T Hindle's problem (Beeb Forum, April 1984), depending

on whether the use of store or speed of execution is the more important factor. He has an array of values Z which depend on two values X and Y. His note does not say explicitly that all these values are integral, but this fact is obvious from his solution. Using a two-dimensional array Z%(X%,Y%) requires nearly 9000 bytes of memory, since the values of X and Y range from 1 to 47. However, the values of Z range only from 1 to 71, which led to his somewhat eccentric solution of encoding the data in a character string.

The first comment is that, since the values of Z are so small, a two-dimensional array of bytes cuts the store usage by 75 per cent (since each integer value normally uses four bytes). Unfortunately, Basic does not provide the facility of using arrays of bytes, but this can be simulated using the indirection operators and the ability of DIM to allocate store and return its address.

Program 2 shows how to set up a 47 x 47 array, with indices ranging from 0 to 46, and clear it to zeros.

A reference to element (X%,Y%) of the array is then written as Z?(X%\*47+Y%). This method uses 2209 bytes of store but gives fast access to individual elements, and makes it easy to set new values. Indices 1 to 47 can, of course, be used instead of 0 to 46, but this requires more computation for each access.

A careful look at Mr Hindle's character string solution shows that, in his

case, the values of Z are unique, and each possible value of Z occurs precisely once. In fact, it seems that the (X,Y) pairs depend on the Z value, rather than vice versa.

Mr Hindle's solution does not in fact store values of Z, but merely a succession of (X,Y) pairs in the right order. Because he uses the INSTR function to search the string, separator characters are necessary. These can be done away with if the string representation is changed to an array of byte pairs. The data then occupies only 142 bytes. Program 3 shows how one could set up the array, using his example data for the first few bytes, and program 4 is a function which returns the Z value corresponding to a given (X,Y), or zero if there is no such value.

Of course, the price paid for such close packing of the data is the time taken by FNZ to search for the (X,Y) values. If it is the case that the X or Y values (or both) increase as Z increases (which is true in the example above) then FNZ can be speeded up by stopping when a value is found that is greater than the one being sought. Alternatively, a technique such as 'binary chop' can be used.

Mr Hindle's problem is an example of a more general problem of how to store sparse arrays efficiently. If the 71 values of Z were not the first 71 integers, but arbitrary (possibly non-unique) values in the range 1-255, then, of the solutions discussed so far, only the two-dimensional array would work.

### Angling text in multicolour

GRAHAM WALKDEN of Banchory, Kinross, has sent a listing (program 5) allowing the users of the BBC A and B and Electron to produce multi-coloured, enlarged text at any position

and/or angle in any graphics mode.

The routine works by printing the message to be placed on the screen, and using the POINT command to sense whether a pixel is to be plotted or

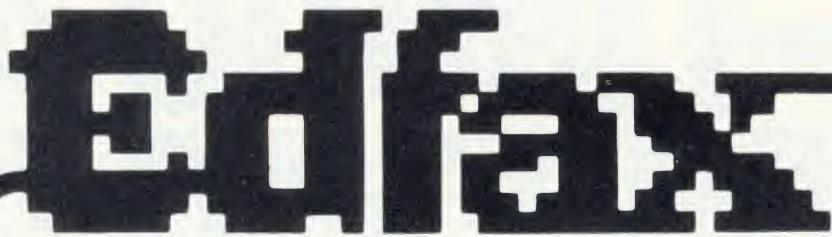
page 79 ►

## SUPERPRINT Demo

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# Voltmace delta 14b

not. Before the program will operate several variables have to be assigned.

M% – the number. The number of pixels in your particular mode has to be multiplied to produce either 1280 for the horizontal axis or 1024 for the vertical, eg, it is 2 in a  $640 \times 256$  mode, 4 in a  $320 \times 256$  mode and 8 in a  $160 \times 256$  mode. Best results are obtained by using mode 1.

XMAG% – the horizontal magnification factor. One is normal.

YMAG% – the vertical magnification factor, 1 again being normal.

COL% – the colour of the characters to be printed (normal colour rules apply).

ANG% – the angle at which the text will be printed. Positive values cause the text to slant upwards, while negative values do the opposite.

To call up the routine you have to use a system of variable-assigned procedures, i.e. PROCPRINT ("Text to be printed", (X co-ordinate), (Y co-ordinate). So:

```
10 MODE1: M% = 4: XMAG% = 2:  
      YMAG% = 2: COL% = 2:  
      ANG% = 2: PROCPRINT  
      ("HELLO", 640, 512): END
```

will cause the word HELLO to be printed in yellow, upward-slanting, double-height, double-width lettering in the centre of the screen.

*Superprint* can be used for all sorts of purposes, and is considerably more effective than the mode 7 double-height lettering.

## Arrays as parameters

IN HER ARTICLE 'Brush up on your writing' (April issue, page 111), writes Allen Hardy of Birmingham. Susan Jones describes some useful facilities peculiar to BBC Basic but observes that it is not possible, without using indirection operators, to write a general procedure using arrays because arrays cannot be parameters. The problem is also discussed by John Ryding (same issue, page 89).

Here's how to do it: the name of the array is passed to the procedure (or function) as the actual parameter, and EVAL is used in the procedure definition to evaluate the formal parameter. Program 6 calls Ms Jones' PROCWordin, rewritten as a function using an array parameter.

The function is similar to PROCWordin in that it repeats a question until you reply with one of the words in the DATA line. It returns the position of the word in the array (the index) to

the main program, which prints it.

Unlike John Ryding's technique, this one can be used only to read arrays and not to write to them.

## Showing the flag for Forth

RICHARD CLARKE of Croydon has some Forthright views. He writes:

It is rare to see items in *Acorn User* relating to BBC languages other than Basic or assembly language. As an Acornsoft Forth user, I hope to set a precedent for others to send in their ideas and thus make Forth more widely known.

Initially, Acornsoft Forth sets LIMIT, the top of memory pointer, to &5800 and allows you two mass-storage buffers (screens). If you are going to use only mode 7, memory from &5800 to &7C00 will be free. To take advantage of this, increase the top of memory pointer to &7C00 by:

```
31744 'LIMIT!
```

and re-allocate storage for your buffers by:

```
n #BUF !SETBUF FLUSH
```

where n is the number of buffers you want (see Forth manual, pages 81–82).

Now that you are using what would be screen memory in any other mode to store your source-code, you must take care not to change mode. This can be done inadvertently by EMITting 22, followed by another number, or TYPEing a string containing 22, which is quite possible if you are using TYPE on the wrong area of memory by mistake. I have found it very useful to prevent 22 being sent to the VDU drivers by the following:

```
DECIMAL : &EMIT DUP 22 = 26  
      ?ERROR(EMIT);  
      ASSIGN EMIT TO-DO &EMIT
```

Now, 22 EMIT gives EMIT ? MSG #26. You can disable this by:

```
ASSIGN EMIT TO-DO (EMIT)
```

## Multiple printing

### with Wordwise

JONATHAN EVANS of Plymouth points out that one of the limitations of Wordwise is that it does not have a facility for multiple printing. This can be very annoying, he says, if you want to run off a number of copies of a short document on fanfold paper. Program 7 provides a short Basic program to simulate this function.

First, design your document on Wordwise in the normal way and proof it carefully. Then save to disc or tape using option 8. This 'spools' the formatted text as an ASCII file (you will lose any special control codes to the printer for underlining etc when you do this). Then return to Basic and run the program. This will read your file into a single byte array and print it out for you as many times as required.

All formatting is preserved by the simple byte-by-byte PRINT CHR\$ at line 280. For example, blank lines are coded as carriage returns (ASCII 13) which are automatically produced by PRINT CHR\$(13).

## Automatic formatter

### in View

THE routine by Susan Jones 'Saving text for View' is a splendid idea, says Bernard Wilson of Ilkley. 'It certainly allows me to make better use of my own micro at home, using a View machine to format and edit the results.'

'However,' he adds, 'it is a bit tedious to have to press RETURN after each line, and forgetting to do so can ruin the whole text. I have improved the routine (see listing 8) to insert a RETURN and to format each line automatically, and to allow text generation in either Mode 3 or Mode 7 (invaluable if you are using a TV).'

## More on

### sequential tapes

G A SMITH has some comments to make on P H Cowley's suggestion for running of programs in sequence on tape (April issue, page 58). He says:

Listing 5 will not work as shown. Line 1 appears to have been added after the program was tested, thus changing TOP-2 to &E31 rather than &E21. Either delete line 1, or change 0E21 to read 0E31. A neater, and more general, solution would be:

```
2 LOMEM = HIMEM - &1000  
4 top$ = STR$-(TOP-2)  
6 REPEAT  
8 DIM X%-1: Y% = X%DIV256  
10 $X% = "L....." + top$  
12 CALL-9
```

'L.' in this case is, of course, an abbreviation for LOAD. 'CALL-9' is a slightly cheaper way of calling the OSCLI at &FFF7.

Incidentally, 'CALL!-4' is a useful way of generating reset, rather than the release-dependent call shown in January's Beeb Forum, page 69.

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# TOP OF THE LIST

Top of the List is a new regular feature in *Acorn User* in which we publish the most interesting, original or useful program received. Our first winner – we pay £25 for the one we publish – is Andrew Britton, who sent us a function key strip printer tested on the Epson FX80, MX80 and RX80 printers and the Star DP510. As it stands the program will print you a sample keystrip suitable for use with View. By editing your own items into the data statements you can

define your own keystrips. To leave a key blank move on to the next item by adding a comma, as demonstrated in line 480 of the program.

Submitted listings should be no longer than 100 lines and authors should enclose a cassette or disc containing the program and, if it is to be returned, an sae.

Entries to: Top of the List, *Acorn User*, 68 Long Acre, London WC2E 9JH.

```

10 REM *** FUNCTION KEY STRIP PRINTER ***
20 REM *** BY ANDREW BRITTON ***
30 REM *** (C) Acorn User July 1984 ***
40:
50 MODE 0
60 PRINT "Function key strip printer (By Andrew Britton (C) 1984)."
70 PRINT "'Enter text in DATA lines at end.'"
80 PRINT "'Set up printer and press <RETURN>'";:FX 21,0
90 REPEAT UNTIL GET=13
100:
110 n=12
120 VDU 2
130 VDU 1,27,1,64 :REM Reset printer
140 VDU 1,15 :REM Condensed characters
150 VDU 1,27,1,ASC"U",1,1 :REM Unidirectional
160 VDU 1,27,1,ASC"3",1,16 :REM Line spacing 16:STAR/MX 24:FX/RX
170:
180 PRINT:PRINT
190:
200 FOR A%=1 TO 10:PRINT "+";STRING$(n,"-");:NEXT:PRINT "+"
210:
220 FOR L%<3 PROCplin(2) ELSE PROCplin(3)
230 IF L%<3 PROCplin(2) ELSE PROCplin(3)
240 FOR A%=1 TO 10:PRINT "+";STRING$(n,"-");:NEXT:PRINT "+"
250 NEXT
260:
270 PRINT:PRINT:PRINT
280 VDU 3
290 END
300:
310 DEF PROCplin(n%)
320 FOR z%=1 TO n%
330 FOR NZ=1 TO 10:READ A$:PRINT "!!";A$;SPC(n-LEN(A$));:NEXT:PRINT "!!"
340 NEXT
350 ENDPROC
360:
370 REM data limited to a maximum of 12 characters/field
380 REM ***** Sample Keystrip For VIEW word processor *****
390:
400 DATA DELETE,NEXT,FORMAT,JUSTIFY,INSERT,DEFAULT,SPLIT,CONCAT,MARK,
410 DATA BLOCK,MATCH,MODE,MODE,RULER,LINE,LINES,AS RULER,
420:
430 DATA MOVE,SWAP,RELEASE,DELETE TO,HLT,HLT,GOTO,SET,EDIT,DELETE
440 DATA BLOCK,CASE,MARGINS,CHARACTER,1,2,MARKER,MARKER,COMMAND,COMMAND
450:
460 DATA FORMAT,TOP OF,BOTTOM,DELETE,BEGINNING,END OF,INSERT,DELETE,INSERT,DEL
ETE
470 DATA BLOCK,TEXT,OF TEXT,END OF LINE,OF LINE,LINE,LINE,CHARACTER,CHARA
CTER
480 DATA , , , , , , , ,

```

DELETE BLOCK	NEXT MATCH	FORMAT MODE	JUSTIFY MODE	INSERT MODE	DEFAULT RULER	SPLIT LINE	CONCAT. LINES	MARK AS RULER	
MOVE BLOCK	SWAP CASE	RELEASE MARGINS	DELETE TO CHARACTER	HIGHLIGHT 1	HIGHLIGHT 2	GOTO MARKER	SET MARKER	EDIT COMMAND	DELETE COMMAND
FORMAT BLOCK	TOP OF TEXT	BOTTOM OF TEXT	DELETE END OF LINE	BEGINNING OF LINE	END OF LINE	INSERT LINE	DELETE LINE	INSERT CHARACTER	DELETE CHARACTER

# HINTS & TIPS

See pages 51-54

## Listings 1-5. Testing the keyboard for the space bar

```
● 10 REM listing 1
● 20 CLS
● 30 PRINTTAB(6,10) "Please press the space bar"
● 40 REPEAT
● 50 A=INKEY(-99)
● 60 UNTIL A=-1
● 70 PRINTTAB(15,15) "Thank you"

● 10 REM listing 2
● 20 CLS
● 30 PRINTTAB(6,10) "Please press the space bar"
● 40 REPEAT
● 60 UNTIL INKEY(-99)
● 70 PRINTTAB(15,15) "Thank you"

● 10 REM listing 3
● 20 CLS
● 30 PRINTTAB(6,10) "Please press the space bar"
● 40 A=INKEY(300)
● 50 IF A=32 THEN PRINTTAB(15,15) "Thank you"
● 60 IF A>32 THEN PRINTTAB(15,15) "Wrong key!"
● 70 IF A=-1 THEN PRINTTAB(15,15) "Too slow!"

● 10 REM listing 4
● 20 CLS
● 30 PRINTTAB(6,10) "Please press the space bar"
● 40 REPEAT
● 50 UNTIL GET=32
● 60 PRINTTAB(15,15) "Thank you"

● 10 REM listing 5
● 20 CLS
● 30 PRINTTAB(6,10) "Please press the space bar"
● 40 REPEAT
● 50 UNTIL GET$=" "
● 60 PRINTTAB(15,15) "Thank you"
```

## Listings 6 and 7. Space bar test procedures for modes 1/4 and 2/5 respectively

```
● 10 REM Listing 6
● 20 MODE 4
● 30 PROCspace
● 40 PRINT"IT WORKS!"
● 50 END
● 60 :
● 10000 DEFPROCspace
● 10010 REM Mode 1/4 procedure to wait
● 10020 REM until space bar is pressed
● 10030 VDU 24,175;10;1100;60;5,18,0,131
● 10040 VDU 12,18,0,0
● 10050 MOVE200,47
● 10060 PRINT"Press space bar to continue"
● 10070 *FX15,0
● 10080 REPEAT:UNTIL GET=32
● 10090 VDU 18,0,128,18,0,3,16,4,26
● 10100 ENDPROC
```

```
● 10 REM Listing 7
● 20 MODE 5
● 30 PROCspace
● 40 PRINT"IT WORKS!"
● 50 END
● 60 :
● 10000 DEFPROCspace
● 10010 REM Mode 2/5 procedure to wait
● 10020 REM until space bar is pressed
● 10030 VDU 24,120;10;1160;60;5,18,0,131
● 10040 VDU 12,18,0,0
● 10050 MOVE180,47
● 10060 PRINT"Press space bar"
● 10070 *FX15,0
● 10080 REPEAT:UNTIL GET=32
● 10090 VDU 18,0,128,18,0,3,16,4,26
● 10100 ENDPROC
```

See 'Logging On', page 32

```

● Program 1. Joe Telford's RS423 simulator
●
● 10 REM SERIAL TRANSMISSION SIMULATOR
● 20 REM J.TELFORD APR. 1984
● 30 PROCinit
● 40 REPEAT
● 50   MODE7
● 60   PROCmenu
● 70   MODE4:PROCsetscreen
● 80   REPEAT
● 90     char=FNtype
● 100    IF char<>27 PROCsend(char)
● 110    UNTIL char=27
● 120    UNTIL FALSE
● 130 END
● 140 DEFPROCinit
● 150 VDU23,128,128,128,128,128,128,128,255
● 160 VDU23,129,255,128,128,128,128,128,128
● 170 VDU23,130,187,170,170,170,170,170,238
● 180 VDU23,131,143,136,136,136,136,136,248
● 190 VDU23,132,60,126,255,255,255,255,126,60
● 200 VDU23,133,60,66,129,129,129,129,66,60,
● 210 VDU23,134,0,62,8,10,106,138,138,107
● 220 DIM Binary(12)
● 230 *FX220,0
● 240 ENDPROC
● 250 DEF PROCmenu
● 260 CLS
● 270 REPEAT INPUTTAB(0,5) "How many data bits/word? (7/8) "D%
● 280   IF D%>8 AND D%<7 VDU7
● 290   UNTIL D%>6 AND D%<9
● 300 REPEAT
● 310   REPEAT:INPUTTAB(0,7)*0(dd) E(ven) or N(o) Parity? "Parity$"
● 320     Parity$=LEFT$(Parity$,1)
● 330     P%=INSTR("0ENoen",Parity$)
● 340     IF P%<1 VDU7
● 350     UNTIL P%>0
● 360     IF P% MOD 3 =0 AND D%>7 PRINT'CHR$131"7 bits and No Parity is
● 370       not allowed.":VDU7
● 380   UNTIL P% MOD 3 >0 OR D%<7
● 390 P%=P% MOD 3
● 400 REPEAT:INPUTTAB(0,11) "How many stop bits? (1/2)      "S%
● 410   IF S%>1 AND S%<2 VDU7
● 420   UNTIL S%>0 AND S%<3
● 430 IF D%>8 AND S%>2 PRINT'CHR$131"1 stop bit only with 8 Data
● 440   bits":S%=1:VDU7
● 450 PRINTTAB(0,15)CHR$131:CHR$136;"Press SPACE to Continue"
● 460 REPEAT UNTIL GET=32
● 470 ENDPROC
● 480 DEF PROCsetscreen
● 490 CLS
● 500 VDU19,0,4,0;0;0;19,1,7,0;0;0;
● 510 PROCrect(0,0,1279,1023)
● 520 PROCrect(320,866,224,96)

```

Continued ►

# JOE'S JOTTINGS

See 'Logging On', page 32

● ◀ *Continued*

● 510 PROCrect(736,866,224,96)  
● 520 PRINTTAB(11,3)"CTS ";CHR\$133  
● 530 PRINTTAB(24,3)"RTS ";CHR\$133  
● 540 PROCrect(128,610,160,192)  
● 550 PROCrect(128,610,160,96)  
● 560 PROCrect(384,610,160,96)  
● 570 PROCrect(384,610,160,192)  
● 580 PRINTTAB(5,8)"CHR"  
● 590 PRINTTAB(13,8)"ASC"  
● 600 PRINTTAB(26,8)"BINARY."  
● 610 PROCrect(736,610,416,192)  
● 620 PROCrect(736,610,416,96)  
● 630 PROCrect(128,354,416,192)  
● 640 PROCrect(128,354,416,96)  
● 650 PROCrect(736,354,416,192)  
● 660 PROCrect(736,354,416,96)  
● 670 PRINTTAB(8,16)"RS432"  
● 680 PRINTTAB(27,16)"MODEM"  
● 690 PRINTTAB(5,26)"SERIAL TRANSMISSION SIMULATOR"  
● 700 PROCsnsr(0)  
● 710 ENDPROC  
● 720 DEF FNtype  
● 730 PROCcts(1)  
● 740 \*FX21,0  
● 750 =GET  
● 760 DEFPROCcts(X)  
● 770 PRINTTAB(15,3);CHR\$(132+(1-X));  
● 780 ENDPROC  
● 790 DEF PROCsnd(ch)  
● 800 PROCcts(0)  
● 810 PRINTTAB(8,11);  
● 820 IF ch>31 AND ch<127 PRINTCHR\$ch ELSE PRINTCHR\$134  
● 830 PRINTTAB(13,11)"":PRINTTAB(16-LEN(STR\$(ch)),11);ch  
● 840 PROCbinary  
● 850 PROCRE432  
● 860 PROCMODEM  
● 870 PROCsound  
● 880 ENDPROC  
● 890 DEFPROCbinary  
● 900 length=D%+S%+SGN(P%)+1  
● 910 binary(0)=0  
● 920 IF D%=2 ch= ch AND 127  
● 930 total=0:FOR IZ=1 TO D%  
● 940     Binary(I%)=ch MOD 2:ch=ch DIV 2  
● 950     total=total+binary(D%-IZ)  
● 960     NEXT  
● 970 binary(length-1)=1  
● 980 IF S%>2 binary(length-2)=1  
● 990 IF P%>0 PROCPrintbin:ENDPROC  
● 1000 binary(D%+1)=1  
● 1010 IF P%>1 AND (total MOD 2)=1 binary(D%+1)=0  
● 1020 IF P%>2 AND (total MOD 2)=0 binary(D%+1)=0  
● 1030 PROCPrintbin:ENDPROC  
● 1040 DEF PROCPrintbin

See 'Logging On', page 32

```
1050 PRINTTAB(24,11); STRING$(length, " ")
1060 PRINTTAB(24,11);
1070 FOR I%= 0 TO length-1
1080   PRINT;binary(I%);
1090   NEXT:ENDPROC
1100 DEFPROCRS432
1110 PRINTTAB(5,19); STRING$(length, " ")
1120 PRINTTAB(5,19);
1130 FOR I%= 0 TO length-1
1140   VDU128+binary(I%)
1150   NEXT:ENDPROC
1160 DEFPROCMODEM
1170 PRINTTAB(24,19); STRING$(length, " ")
1180 PRINTTAB(24,19);
1190 FOR I%= 0 TO length-1
1200   VDU130+binary(I%)
1210   NEXT:ENDPROC
1220 DEFPROCsound
1230 FOR I%= 0 TO length-1
1240   SOUND1,-15,binary(I%)*48+156,0
1250   NEXT:ENDPROC
1260 DEFPROCscr(x):IFx=0 THEN VDU23;
  8202;0;0;0; :ELSE VDU23;29194;0;0;0;
1270 ENDPROC
1280 DEF PROCrect(x,y,l,w)
1290 MOVEX,y:DRAWX+1,y
1300 DRAWX+1,y+w
1310 DRAWX,y+w
1320 DRAWX,y
1330 ENDPROC
```

V

#### Program 2. Direct BBC to BBC comms.

```
10 REPEAT:IF(7&FE08 AND 1)=1 ch=7&FE09;
  VDUch:IF ch=13 PRINT
20 A$=INKEY$(0):IFA$(>"") 7&FE09=ASC A$:
  PRINTA$:IFA$=CHR$13 PRINT
30 UNTIL0
```

#### Program 3. Pocket terminal program for most modems and phone comms.

```
5 *FX8,3
5 *FX7,3
10 REPEAT:IF(7&FE08 AND 1)=1 VDU(7&FE09 AND 127)
20 A$=INKEY$(0):IFA$(>"") 7&FE09=ASC A$:
30 UNTIL0
```

# AN INSPECTOR CALLED

INSPECT is a useful utility provided by Martin Clayden, which enables you to examine a Basic program held on disc without affecting one already in memory.

To use the program type in the source program as shown, run it then save the object code using:

VI

```
*SAVE "VIEW" 8D09F08D0
```

Ensure that the program you wish to view is on the same disc and enter:

```
*INSPECT <fsp>
```

where fsp is the name of the file to be viewed. If the program cannot be found the message 'File not found' will be issued.

If the program is too large to fit in the

available memory the message 'INSPECT space' will be displayed. 'Not Basic' will be output if the program is not a Basic program.

As the Beeb is placed into paged mode by the program the Shift key should be pressed to continue the listing.

Pressing Escape at any time will abort the listing.

● 100 REM *** INSPECT V1.2 ***	640 LDA #5	\POINT TO	1190 RTS	\AND END
● 110 REM *** By M.Clayden ***	650 STA &70		1200 .out1	
● 120 REM *** Acorn User ***	660 LDA #7	\FILE NAME	1210 JSR close	
● 130	670 STA &71		1220 .out2	
● 140 osfind=&FFCE:osargs=&FFDA:	680 LDA loadin		1230 JSR output	
osfile=&FFDD	690 STA &73		1240 RTS	
● 150 oswrch=&FFEE:osnewl=&FFE7:	700 LDX #&70	\POINT TO	1250 .newv	
osbyte=&FFFF4	710 LDY #0	\PARAMETER	1260 LDA #126 \ACKNOWLEDGE	
● 160 page=&18:maxsize=&B7:	720 LDA #&FF	BLOCK	1270 JSR osbyte \ESCAPE	
handle=&B4:top=&13	730 JSR osfile	\LOAD FILE	1280 LDA #25	
● 170 loadin=&BE:himem=7	740 LDY #0		1290 STA page \RESTORE PAGE	
● 180 BRKV=&202:BASIC=&BA99:	750 STY loadin-1		1300 JSR osnewl	
BREAK=&B433	760 LDA (&BD),Y		1310 LDA #(BREAK	
● 190 FOR PASS=0 TO 3 STEP 3	770 CMP #&0D		MOD 256)	
200 P%=&08D0	780 BEQ ok4	\CHECK THAT	1320 STA BRKV \RESTORE	
● 210 !OPT PASS	790 LDX #(NB-MSG)\IT IS BASIC		1330 LDA #(BREAK	
220 LDX top	800 JMP out1		DIV 256)	
● 230 INX	810 .ok4		1340 STA BRKV+1 \BREAK VECTOR	
● 240 STX loadin	820 LDA #(newv		1350 JMP BASIC	
\RECORD TOP	MOD 256)		1360 RTS	
● 250 LDX himem	830 STA BRKV	\REDIRECT	1370 .MSG	
\STORE	840 LDA #(newv		1380 ]	
● 260 DEX	DIV 256)		1390 REM ADD TEXT TO END	
\VALUE OF	850 STA BRKV+1	\BREAK VECTOR	OF CODE	
● 270 TXA	860 LDA loadin		1400	
\LARGEST	870 STA page		1410 len=0:NB=FNTTEXT	
● 280 SEC	880 LDA #12		("Not BASIC")	
\LOADABLE	890 JSR oswrch	\CLEAR SCREEN	1420 V=FNTTEXT	
● 290 SBC loadin	900 LDX #(V-MSG)		("Inspecting")	
\PROGRAM	910 JSR output		1430 VS=FNTTEXT	
● 300 STA maxsize	920 LDA #14		("INSPECT space")	
\FOR THIS MODE	930 JSR oswrch	\PAGING ON	1440 SY=FNTTEXT	
● 310 LDX #5	940 LDA #138		("Syntax: INSPECT <fsp>")	
● 320 LDA &700,X	950 LDX #0		1450 NF=FNTTEXT	
\GET COMMAND	960 .inbuf	\PUT LIST	("File not found")	
● 330 CMP #&20	970 STX &B0	\AND	1460 RS=FNTTEXT	
\SPACE ?	980 LDY RS,X	\?24=25	("L." +CHR\$(13) +"?24=25"	
● 340 BEQ ok1	990 BEQ out	\IN	+CHR\$(13)+CHR\$(0))	
● 350 LDX #(SY-MSG) \SYNTAX	1000 LDX #0	\KEYBOARD	1470 NEXT PASS	
● 360 JMP out2	1010 JSR &FFF4	\BUFFER	1480 END	
● 370 .ok1	1020 LDX &B0		1490 DEFFNTEXT(A\$)	
● 380 INX	1030 INX		1500 L=len:len=len+LEN(A\$)+1	
● 390 LDA #&40	1040 JMP inbuf		1510 \$(MSG+L)=A\$	
\OPEN FOR	1050 .out		1520 =MSG+L	
● 400 LDY #7	1060 RTS			
\READ	1070 .output	\DISPLAY		
● 410 JSR osfind	1080 .char LDA	\MESSAGE		
\ONLY	MSG,X			
● 420 STA handle	1090 JSR oswrch	\ROUTINE		
● 430 BNE ok2	1100 INX			
● 440 LDX #(NF-MSG) \NOT FOUND	1110 CMP #&0D			
● 450 JMP out2	1120 BNE char			
● 460 .ok2	1130 JSR osnewl			
● 470 TAY	1140 RTS			
● 480 LDX #&70	1150 .close			
● 490 LDA #2	1160 LDY handle			
● 500 JSR osargs	1170 LDA #0	\CLOSE THE		
● 510 LDA &71	1180 JSR os	\FILE		
\SIZE - HI				
● 520 CMP maxsize				
● 530 BCC ok3				
● 540 LDX #(VS-MSG) \TOO LARGE				
● 550 JMP out1				
● 560 .ok3				
● 570 JSR close				
● 580 LDA #0				
\CLEAR				
● 590 LDX #&12				
\PARAMETER				
● 600 .cl				
\SPACE				
● 610 STA &6F,X				
● 620 DEX				
● 630 BNE cl				

See pages 75-79

**Program 1. Machine code program to auto-run a Basic program, by Phil Collet**

```

10 REMXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXX
20 VDU15
30 *FX247.76
40 *FX248.6
50 A%=249 : Y%=0 : X%=PAGE DIV 256
60 CALL &FFF4
70 FOR I%=0 TO 3 STEPS
80 P%=PAGE+6
90 LDFT I%
100 LDA #138
110 LDX #0
120 LDY #79
130 JSR &FFF4
140 LDY #76
150 JSR &FFF4
160 LDY #68
170 JSR &FFF4
180 LDY #14
190 DEY
200 JSR &FFF4
210 LDY #82
220 JSR &FFF4
230 LDY #85
240 JSR &FFF4
250 LDY #78
260 JSR &FFF4
270 LDY #14
280 DEY
290 JSR &FFF4
300 RTS : ]
310 NEXT

```

**Program 2.**

```

10 DIM Z 47*47
20 FOR X% = 0 TO 46
30 T% = X%*47
40 FOR Y% = 0 TO 46
50 Z?(T%+Y%) = 0
60 NEXT Y%
70 NEXT X%

```

**Program 3.**

```

10 DIM Z 142
20 FOR I% = 0 TO 141
30 READ J%
40 Z?I% = J%
50 NEXT
60 DATA 1,1,2,7,12,8,...

```

**Program 4.**

```

10 DEF FNZ(X%,Y%)
20 LOCAL I%
30 I% = 0
40 REPEAT
50 IF (Z?(I%)=X%) AND (Z?(I%+1)=Y%) THEN = (I% DIV 2) + 1
60 I% = I% + 2
70 UNTIL I% > 140
80 =0

```

**Program 5. New angles on screen lettering by Graham Walkden**

```

>
5 REM SUPERPRINT - GRAHAM WALKDEN
10 MODE1
20 COL%=3:M%=4:XMAG%=2:YMAG%=2:ANG%=-0
30 PROCPRIINT ("SUPERPRINT Demo",70,960
)
40 COL%=1:XMAG%=1:YMAG%=2:ANG%=-4
50 PROCPRIINT ("Any Angle",820,600)
60 XMAG%=1:YMAG%=1:ANG%=-0
70 PROCPRIINT ("NORMAL SIZED",100,750)
80 COL%=3:ANG%=-2
90 PROCPRIINT ("FOR BBC MICRO MODEL B",
100,550)
100 COL%=3:ANG%=-2:PROCPRIINT ("OR BBC A-
MODE 4",120,300)
110 COL%=2:ANG%=-0:XMAG%=1:YMAG%=-2
120 PROCPRIINT ("BY GRAHAM WALKDEN",110,
100)
130 PROCPRIINT (" ",0,0)
200 END
250 :
30010 DEF PROCPRIINT (D$,X%,Y%)
30020 X1%=X%:Y2%=Y%:SCOL0,COL%
30030 PRINTTAB(0,30);D$:STRING$(39-LEND$-
," ")
30040 FOR J=32 TO 64 STEP (M%/YMAG%):Y1%=
Y2%
30050 FOR I%=0 TO (LEND$*(M%*8))STEP M%
30060 IFPOINT(I%,J)<>OPLOT69,X1%,Y1%:PLO
T1,M%*XMAG%,0:X1%=X1%+M%*XMAG%+2 ELSE X1%-
=X1%+M%*XMAG%+2
30070 Y1%=Y1%+ANG%
30080 NEXT
30090 X1%=X%:Y2%=Y2%+4
30100 NEXT
30110 ENDPROC

```

**Program 6. Using an array parameter, by Allen Hardy**

```

>
10 REM
20 N=5
30 DIM TABLE$(N)
40 FOR I=1 TO N
50 READ TABLE$(I)
60 NEXT I
70 PRINT FNWORDIN("TABLE","WHICH DIRECTION",N)
80END
90 =====
100 DEFFNWORDIN(ARRAY$,MESS$,N) LOCAL W,WORD$
120 REPEAT PRINTMESS$::INPUT WORD$::W=0
130 REPEAT W=W+1
140 UNTIL WORD$=EVAL (ARRAY$+"$("+STR$W+")")
OR W=N
150 UNTIL W<N
160 =W
170 =====
180 DATA BACK, FORWARD, LEFT, RIGHT, ""

```

See pages 75-79

● Program 7. Multiple printing with Wordwise, by Jonathan Evans

```
NVDU1,27,1,69
>LIST
 10REM UTILITY TO PRINT MULTIPLE
 20REM COPIES FROM SPOOLED
 30REM WORDWISE FILES
 40REM BY JONATHAN EVANS
 50REM
 60REM FOR SERIAL PRINTER ENTER *FX
 70REM COMMANDS AS APPROPRIATE
 80DIM A% 20000
 90MODE?
100REPEAT
110CLS:INPUT"Enter name of file to be
printed""or type END ";N$
120IF N$="END" THEN MODE?:END
130INPUT"How many copies do you requi
re ";N%
140IF N%>10 PRINT"Are you sure you wa
nt that many?":REPEAT:G$=GET$:UNTIL G$="Y"
OR G$="N":IF G$="N" GOTO 130
150PRINT"Ensure that you have the cor
rect disc""or tape in position and that
printer""is switched on and at 'top of
form'.";"Press SPACEBAR to start."
160*FX15,1
170REPEAT UNTIL GET=32
180F=OPENIN(N$)
190KOUNT=0
200REPEAT
210A%?KOUNT=BGET#F
220KOUNT=KOUNT+1
230UNTIL EOF#F
240CLOSE#F
250FOR I=1 TO N%
260VDU2
270FOR J=0 TO KOUNT
280PRINT CHR$(A%?J);
290NEXT J
300VDU1,12
310REM THE ABOVE SENDS PRINTER TO TOP
320REM OF FORM BETWEEN PRINTING OF
330REM EACH COPY. CHECK THAT CODE 12
340REM IS CORRECT FOR YOUR PRINTER
350NEXT I
360VDU3
370UNTIL FALSE
```

VIII

● Program 8. Saving text for View, with each line formatted automatically, by Bernard Wilson

```
LIST
10 REM ***** VIEW3/7 *****
20 REM **** B.WILSON (C) ****
30 REM ****
40 CLS
50 REPEAT
60 PRINTTAB(2,5):CHR$(141):CHR$(131):"VIEW Text File Transfer Utility"
70 PRINTTAB(2,6):CHR$(141):CHR$(131):"VIEW Text File Transfer Utility"
80 PRINTTAB(0,12):CHR$(141):CHR$(133):CHR$(136):"Edit & Format after loading
to VIEW"
90 PRINTTAB(0,13):CHR$(141):CHR$(133):CHR$(136):"Edit & Format after loading
to VIEW"
100 PRINTTAB(2,17):CHR$(131)"Press TAB to Terminate and SAVE"
110 PRINTTAB(2,21):CHR$(131)"Select MODE 3 or MODE 7 ?...":G#=GET#
120 UNTIL G$="3" OR G$="7"
130 mode=VAL(G$)
140 MODEmode:N%=HIMEM-LOMEM-124:*FX11,0
150 DIM B% N%:P%=B%:L%=0:@%:5:C%:&000
160 PROCbytesleft
170 REPEAT
180 G#=GET#
190 PRINTG#:
200 IF G$=CHR$&7F THEN P%=P%-2 ELSE #P%=G#
210 IF G$=CHR$&D THEN PRINT
220 P%=P%+1:N%=N%-1
230 IF mode=3 AND POS=79 THEN PROCDR
240 IF mode=7 AND POS=39 THEN PROCCR
250 UNTIL G$=CHR$&9 OR N%<255
260 #(P%-1)=CHR$&D
270 PRINT"Name of text file to be written ":
280 INPUT #C%:IF #C%="" THEN #C%="TEXT" ELSE #C%=LEFT$(#C%,6)
290 #C%="SAVE "+#C%+" "+STR$~B%+" "+STR$~P%
300 PRINT "#C%":X%=0:Y%=&C:CALL &FFF7
310 MODE7:*FX12,0
320 END
330 DEFFPROCCR
340 M%=P%
350 REPEAT:M%=M%-1:VDU127:UNTIL ?M%=&20
360 ?M%=&D
370 vpos=VPOS
380 PROCbytesleft
390 PRINTTAB(0,vpos)
400 PRINT$(M%+1):
410 ENDPROC
420 DEF PROCbytesleft
430 PRINTTAB(0,1)N%" bytes remaining.
440 ENDFROC
```

See 'The Beeb in Slow Time', page 81

- Program 1. Setting up and demonstrating program for slow-speed operation of the BBC micro (enter it with PAGE<sub>i</sub> = &2000)

```

10 PROCassembly
20 PROCinit
30 REPEAT
40 A$ = GET$
50 A = ASC(A$)
60 IF A = 0 VDU 0
70 IF A>47 AND A<56 MODE A-48:A = 0
80 IF A$ = "T" PROC_T_window:A = 0
90 IF A$ = "G" PROC_G_window:A = 0
100 IF A$ = "F" PROCfill:A = 0
110 IF A$ = "W" PROCwait:A = 0
120 IF A$ = "Z" MODE 6:PROCzero_page_map:
A = 0
130 IF A VDU A
140 UNTIL0
150 END
160
170 Interrupt Routines
180 *****
190
200 DEF PROCassembly
210 IF ?&FE62 = 1 CALL Z%
220 oldIRQ1V = !&204 AND &FFFF
230
240 FOR N% = 0TO2 STEP 2
P% = &D00
260
270 COPT N%
280 NOP:NOP:NOP \ NMI Routine
290 NOP:NOP \ *****
300 NOP:NOP
310 RTI
320 J
330
340 P% = &C00
350 COPT N%
360 .IRQ1V
\ *****
380 BIT &FE60
390 BVS pb7 \ PB6 pressed?
400 LDA #0
410 STA &FE60 \ Switch pulses ON
420
430 LDA #&FF
440 STA &AB0
450 STA &AB1
460 STA &AB2 \ Make a white marker
470 STA &AB3 \ visible on the bit map
480 JMP oldIRQ1V
490
500 .pb7
510 BMI no_key_pressed \ PB7 pressed?
520 LDA #1
530 STA &FE60 \ Switch pulses on
540
550 LDA #0
560 STA &AB0
570 STA &AB1
580 STA &AB2
590 STA &AB3 \ Remove white marker
600
610 .no_key_pressed
620 JMP oldIRQ1V
630
640 .on \ Change IRQ1 Vector
650 \ *****
660 SEI
670 LDA #IRQ1V MOD 256

```

```

680 STA &204
690 LDA #IRQ1V DIV 256
700 STA &205
710 CLI
720
730 \ initialise the VIA
\ *****
740 LDA #1 \ Set PB0 as O/P
750 STA &FE62 \ Data direction reg. B
770 RTS
780
790 .off \ Restore original IRQ1V
800 \ *****
810 SEI
820 LDA #oldIRQ1V MOD 256
840 STA &204
850 LDA #oldIRQ1V DIV 256
860 STA &205
870 CLI
880 RTS
890 J
900
910 NEXT
920 ENDPROC
930
940 DEF PROCinit
950 ON ERROR PROCerr_handle:END
960 *FX12,2
970 REM increase auto-repeat
speed
980 *FX16,0
990 REM ADC interrupts off
1000 CALL on :REM Enable
1010 Z% = off :REM To allow IRQ to be
switched
1020 :REM off before re-assembly
1030
1040 *KEY 10 PAGE = &2000!MOLDIM
1050
1060 CLS
1070 PRINT"Adjust speed of pulses."
1080 PRINT'"Press PB7 when ready."
1090 ?&FE60 = 0 :REM slow down

```

Continued ►

Program 3. Produces a display mimicking the effect when you run program 1 and clear the screen at slow speed. Press the space bar to start and stop the progress of the display

```

10 MODE0
20 VDU19;4;0;:REM If you like
blue background
30 FOR M%=1TO80*32-1
40 PRINT"X";
50 NEXT
60 FOR M%=0 TO 255
70 FOR N%=&3000 TO &7F00 STEP 256
80 N%?M%=0
90 IF INKEY(0)>0 REPEAT
UNTIL INKEY(0)>0
100 NEXT
110 NEXT

```

# HARDWARE

*See 'The Beeb in Slow Time', page 81*

◀ *Continued*

```
1100 REPEAT
1110     PRINT"1";
1120     UNTIL (?&FE60 AND 1) = 1
1130 REM i.e. PB7 was pressed and IRQ
1140 REM routine has set PB0 to logic 1
1150
1160 CLS
1170 PRINT"Ready"
1180 ENDPROC
1190
1200 DEF PROC_T_window
1210 VDU28,10,25,70,10
1220 ENDPROC
1230
1240 DEF PROC_G_window
1250 VDU24,100;200;1100;900
1260 ENDPROC
1270
1280 DEF PROCfill
1290 D$ = GET$
1300 IF D$ = "A" PROCalphabet:ENDPROC
1310 FOR N% = 0TO2556
1320     IF D$ = "R" VDU(32+RND(95)) ELSE PRINT D$;
1330     NEXT
1340 ENDPROC
1350
1360 DEF PROCwait
1370 REPEAT
1380     UNTIL (?&FE60 AND 1). = 0
1390 ENDPROC
1400
1410 DEF PROCzero_page_map
1420 VDU19;4;0;
1430 VDU23;12;0;0;0;
1440 ?&34E = 0
1450 VDU12,28,0,24,39,14,12
1460 ?&E00 = 13:?&E01 = 255
1470 FOR I% = &E02 TO &1000:?I% = 0:NEXT
1480 ENDPROC
1490
1500 DEF PROCalphabet
1510 FOR N% = 1TO100
1520     PRINT"ABCDEFGHIJKLMNPQRSTUVWXYZ";
1530     NEXT
1540 ENDPROC
1550
1560 DEF PROCerr_handle
1570 ?&FE60 = 1
1580 REPORT
1590 PRINT" at line ";ERL
1600 ENDPROC
```

See 'Triple Test', page 155

● Listing 1.

● Acorn

```
● 10 REM *IEEE488 with string data output
● 20 M=&4000 :REM Set pointer to base address of array
● 30 progend%=?&71*&100+?&70 :REM Calculate data array end address
● 35 *IEEE :REM Call IEEE file
● 40 cmd%=openin("COMMAND") :REM Open command channel
● 50 data%=openin("DATA") :REM Open data channel
● 60 PRINT#cmd%, "BBC DEVICE NO", 1 :REM Set device address of BBC computer
● 70 PRINT#cmd%, "CLEAR" :REM Intilialise interface
● 80 printer%=openin("4") :REM Set printer device address
● 90 PRINT#cmd%, "LISTEN", printer%, "EXECUTE" :REM Set printer to listen
● 100 REPEAT
● 110 M$$=M$ :REM Get data string from memory
● 120 PRINT#data%, M$ :REM Output data string
● 130 M=M+LEN(M$)+1 :REM Update pointer
● 140 UNTIL M>=progend% :REM Until end of data array
● 150 CLOSE#printer% :REM close printer channel
● 160 CLOSE#data% :REM Close data channel
● 170 CLOSE#cmd% :REM Close command channel
```

XI

● Listing 2.

● Acorn

```
● 10 REM *IEEE488 with binary data output
● 20 M=&4000 :REM Set pointer to base address of data array
● 30 progend%=?&71*&100+?&70 :REM Calculate end address of data array
● 40 *IEEE :REM Call IEEE file
● 50 cmd%=openin("COMMAND") :REM Open command channel
● 60 data%=openin("DATA") :REM Open data channel
● 70 PRINT#cmd%, "BBC DEVICE NO", 1 :REM Set device address of BBC computer
● 80 PRINT#cmd%, "CLEAR" :REM Intialise interface
● 90 printer%=openin("4") :REM Open printer channel
● 100 PRINT#cmd%, "LISTEN", printer%, "EXECUTE" :REM Set printer to listen
● 110 PRINT#cmd%, "WRITE BINARY", PROGEND%-&4000 :REM Set binary output
● and number of bytes
● 130 REPEAT
● 140 BPUT#data%, ?M :REM Output data byte
● 150 M=M+1 :REM Update pointer
● 160 UNTIL M=progend% :REM Until end of data array
● 170 CLOSE#printer% :REM Close printer channel
● 180 CLOSE#data% :REM Close data channel
● 190 CLOSE#cmd% :REM Close command channel
```

● Listing 3.

● Cambridge Computer Consultants

```
● 10 REM Cambridge Computer Consultants IEEE488 data string output
● 20 M=&4000 :REM Set base address of data block
● 30 progend%=?&71*&100+?&70 :REM Calculate end address of data array
● 40 printer%=&4:sec_add%=-1 :REM Set device primary & secondary addresses
● 50 PROCIEINIT(&FC20) :REM Initialise the interface
● 60 PROCIEWRIT(printer%, sec_add%) :REM Open printer channel
● 70 PROCIEPUTA(M, progend%-M) :REM Output data array from memory
● 80 PROCIECLR :REM Close channel, good housekeeping!
```

# HARDWARE REVIEWS

See 'Triple Test', page 155

● Listing 4.

● Cambridge Computer Consultants

```
● 10 REM Cambridge Computer Consultants IEEE488 data byte output
● 20 M=&4000 :REM Set base address of data block
● 30 progend%=?&71*&100+?&70 :REM Calculate end address of data array
● 40 printer%4:sec_add%=-1 :REM Set device primary & secondary addresses
● 50 PROCIEINIT(&FC20) :REM Initialise the interface
● 60 PROCIEWRIT(printer%,sec_add%) :REM Open printer channel
● 70 REPEAT
● 80 PROCIEPUTB(?M) :REM Output data byte
● 90 M=M+1 :REM Update pointer
● 100 UNTIL M=progend% :REM Until end of data
● 110 PROCIECLR :REM Close channel, good housekeeping!
```

XII

● Listing 5.

● C.S.T. - Procyon

```
● 10 REM IEEE488 C.S.T. - Procyon data string output
● 20 M=&4000 :REM Set pointer to base address of data array
● 30 progend%=?&71*&100+?&70 :REM Calculate end address of data array
● 40 *IEEE :REM Call IEEE file
● 50 REPEAT
● 60 M$=$M :REM Get data string from memory
● 70 PRINT#4,M$ :REM Output data string
● 80 M=M+LEN(M$)+1 :REM Update pointer
● 90 UNTIL M>=progend% :REM Until end of data array
```

● Listing 6.

● C.S.T. - Procyon

```
● 10 REM IEEE488 C.S.T. - Procyon data byte output
● 20 M=&4000 :REM Set pointer to base address of data array
● 30 progend%=?&71*&100+?&70 :REM Calculate end address of data array
● 40 *IEEE :REM Call IEEE file
● 50 printer%OPENOUT"4" :REM Open printer channel
● 60 REPEAT
● 70 BPUT#printer%,?M :REM Output data byte
● 80 M=M+1 :REM update pointer
● 90 UNTIL M=progend% :REM Until end of data array
```



See 'Pixels on Paper' and 'A Dump in its True Colours', pages 163-167

```

● 10 REM *** C/EPAT ***
● 20 REM Hybrid program to dump all graphics MODEs in actual colour
● 30 REM on any printer with the ESCape L n1 n2 graphics facility
● 40 REM including EPSONS, STARS, CANONS, SHINWA, INFORUNNER etc
● 50 REM G.B.Hill September 1983
● 60 REM PROGRAM START
● 70 S%=&A00
● 80 ?&80=00:&81=&0A: REM point to pattern
● 90 PROCcheck
● 100 IF NOT graphics THEN PRINT"Not a graphics MODE. Can't dump.":VDU7:END
● 110 PROCassemble
● 120 REM enable printer, and set linefeed (send ESC A 8)
● 130 VDU2,1,27,1,65,1,8
● 140 REM clear paper
● 150 VDU1,10,1,10,1,10
● 160 FOR X%=0 TO 1279 STEP 16
● 170 REM send bit code (ESC L 0 3 - 768 dots per line)
● 180 VDU1,27,1,76,1,0,1,3
● 190 FOR Y%=0 TO 1023 STEP 4
● 200 !Xlo=X%+Y%*&10000
● 210 CALL three_bytes
● 220 NEXT
● 230 VDU1,10
● 240 NEXT
● 250 REM reset linefeed and disable printer
● 260 VDU1,27,1,65,1,12,1,12,3
● 270 END
● 280
● 290 DEFPROCcheck
● 300 DIM user_3
● 310 A%=&87
● 320 !user=USR(&FFF4)
● 330 mode=user%2
● 340 IF mode>5 OR mode=3
●     THEN graphics=FALSE ELSE graphics=TRUE
● 350 ENDPROC
● 360
● 370 DEFPROCcassemble
● 380 osword=&FFF1
● 390 oswrch=&FFEE
● 400 pattern=S%
● 410 !pattern=&0d010200
● 420 pattern!4=&07050306
● 430 pattern!8=&03020000
● 440 pattern!12=&07050501
● 450 S%=S%+16
● 460 Xlo=S%
● 470 Xhi=S%+1
● 480 Ylo=S%+2
● 490 Yhi=S%+3
● 500 logical=S%+4
● 510 value=S%+5
● 520 byte=S%+9
● 530 count_8=S%+12
● 540 mode=S%+13
● 550 S%=S%+14
● 560 FOR opt=0 TO 2 STEP 2
● 570 P%=S%
● 580 [OPT opt
● 590 \SUBROUTINES
● 600 \to calculate POINT(X,Y)
● 610 .point      idx #Xlo MOD 256
● 620             ldy #Xlo DIV 256
● 630             lda #9
● 640             jsr osword
● 650             ldx #logical MOD 256
● 660             ldy #logical DIV 256
● 670             lda #8B
● 680             jsr oswrch
● 690             rts
● 700 \subroutine to print three prepared bytes
● 710 .print_bytes idx #2
● 720 .loop        lda #1
● 730             jsr oswrch
● 740             lda byte,X
● 750             jsr oswrch

```

```

● 760             dex
● 770             bpl loop
● 780             rts
● 790 \increment X by 2
● 800 .inc_X2      clc
● 810             lda Xlo
● 820             adc #2
● 830             sta Xlo
● 840             lda Xhi
● 850             adc #0
● 860             sta Xhi
● 870             rts
● 880 \to calculate three bytes & print them
● 890 .three_bytes lda #8
● 900             sta count_8
● 910 .byte_loop   jsr point
● 920             lda value
● 930             and #7
● 940             tay
● 950             lda (&80),Y
● 960             ror A
● 970             rol byte
● 980             ror A
● 990             rol byte+1
● 1000            ror A
● 1010            rol byte+2
● 1020            lda user+2
● 1030            eor #0
● 1040            beq mode0
● 1050            lda &80
● 1060            eor #8
● 1070            sta &80
● 1080 .mode0      jsr inc_X2
● 1090            dec count_8
● 1100            bne byte_loop
● 1110            jsr print_bytes
● 1120            rts
● 1130 ]
● 1140 NEXT
● 1150 IF P%<>&A89 THEN PRINT'"You must have made an
●           error in the assembly language routine.
●           "'Please check it.":VDU7:END
● 1160 ENDPROC

```

Listing 3. A 'universal' pattern dump for all graphics modes.

See 'Pixels on Paper' and 'A Dump in its True Colours', pages 163-167

**Listing 4. Assembly language dump for Canon PJ1080A.**

```
● 10 REM MACCAN4
● 20 REM Copyright G.B.Hill
● 30 REM March 1984
● 40 REM Version 4
● 50 REM Prints all graphics modes using physical colour
● 60 REM Assembly language printer dump for CANON PJ1080A printer
● 70 REM with all slow subroutines removed
● 80
● 90 MODE7
● 100 REM Operating system addresses
● 110 oswrch=&FFEE
● 120 osascii=&FFE3
● 130 osword=&FFF1
● 140 osbyte=&FFF4
● 150 osargs=&FFDA
● 160 osccli=&FFF7
● 170 DIM user 3,cli 30
● 180 REM Locate program
● 190 PROCfiling_system
● 200 IF tape THEN base=&D00
● 210 IF disc THEN base=&A00
● 220 IF NOT (tape OR disc) THEN PRINT"Can't *SAVE, unrecognised filing system.":VDU7:END
● 230 S%=base
● 240 REM reserve space for jump
● 250 S%=S%+3
● 260 REM Set up constants and variables
● 270 REM Xlo,Xhi bytes of X coord: Ylo,Yhi bytes of Y coord
● 280 Xlo=S%:Xhi=S%+1:Ylo=S%+2:Yhi=S%+3
● 290 !Xlo=&03FF0000
● 300 REM logicol is the byte where osbyte deposits the logical colour
● 310 logicol=S%+4
● 320 REM value is the byte where osbyte deposits the physical colour
● 330 value=S%+5
● 340 S%=S%+9
● 350 REM Store starting coordinates for subroutine setzero
● 360 XYstore=S%
● 370 !XYstore!=Xlo
● 380 S%=S%+4
● 390 message=S%
● 400 $message="Only modes 1,2,4 and 5"+CHR$13+CHR$(7)
● 410 S%=S%+24
● 420 control=S%
● 430 $control=CHR$27+"r"+CHR$1+CHR$80
● 440 S%=S%+4
● 450 REM pass and cnt8 are counters, store is a byte to pass to the printer.
● 460 cnt8=S%
● 470 pass=S%+1
● 480 store=S%+2
● 490 !cnt8=&000000108
● 500 S%=S%+4
● 510 FOR PASS=0 TO 2 STEP 2
● 520 PX=S%
● 530 [
● 540 OPT PASS
● 550 \
● 560 \SUBROUTINES
● 570 \
● 580 \Reset X and Y to screen top left
● 590 \
● 600 .setzero    lda #3
● 610 .pling      lda XYstore,X
● 620             sta Xlo,X
● 630             dex
● 640             bpl pling
● 650             rts
● 660 \
● 670 \Check current mode, if not graphics,
     issue error message and set carry flag.
```

**Listing 5. How long does a screenful take?**

```
● 10 REM Printer Benchmark
● 20 REM Time taken to print 25
●     rows of 80 characters
● 30 VDU2,1,7,1,13
● 40 FOR I=1 TO 25
● 50 FOR J=1 TO 40
● 60 VDU1,42,1,120
● 70 NEXT
● 80 VDU1,13
● 90 NEXT
● 100 VDU1,7,1,13,3
```

See 'Pixels on Paper' and 'A Dump in its True Colours', pages 163-167

```

● 680 \
● 690 .modecheck lda #887
● 700 jsr osbyte
● 710 tya
● 720 cmp #6
● 730 bpl wrongmode
● 740 cmp #3
● 750 beq wrongmode
● 760 .rightmode clc
● 770 rts
● 780 .wrongmode ldy #00
● 790 .msg lda message,Y
● 800 jsr osascii
● 810 iny
● 820 cpv #24
● 830 bne msg
● 840 sec
● 850 rts
● 860 \
● 870 % MAIN PROGRAM
● 880 \
● 890 .canon jsr modecheck
● 900 bcc start
● 910 rts
● 920 .start jsr setzero
● 930 lda #2
● 940 jsr oswrch
● 950 .scan ldy #0
● 960 .ctrl lda #01
● 970 jsr oswrch
● 980 lya control,Y
● 990 jsr oswrch
● 1000 iny
● 1010 cpv #4
● 1020 bne ctrl
● 1030 .line ldx #Xlo MOD 256
● 1040 \osword to get physical colour
● 1050 ldy #Xlo DIV 256
● 1060 lda #809
● 1060 jsr osword
● 1070 ldx #logicol MOD 256
● 1080 ldy #logicol DIV 256
● 1090 lda #8B
● 1100 jsr osword
● 1110 .onebit lda value
● 1120 \select the colour to be printed
● 1130 .rgb dec
● 1140 beq this_colour
● 1150 ror A
● 1160 jmp rgb
● 1170 .this_colour ror A
● 1180 rol store
● 1190 \
● 1200 .incx2 clc
● 1210 lda Xlo
● 1220 adc #02
● 1230 sta Xlo
● 1240 lda Xhi
● 1250 adc #0
● 1260 sta Xhi
● 1270 \
● 1280 dec cnt8
● 1290 bne line
● 1300 \
● 1310 .printchar lda #01
● 1320 jsr oswrch
● 1330 lda store
● 1340 jsr oswrch
● 1350 \
● 1360 lda #8
● 1370 sta cnt8
● 1380 \
● 1390 .eol lda Xhi
● 1400 cmp #05
● 1410 bne line
● 1420 .resetXhi lda #0
● 1430 sta Xhi
● 1440 \
● 1450 inc pass
● 1460 lda pass
● 1470 cmp #4
● 1480 bne line
● 1490 \
● 1500 lda #1
● 1510 sta pass
● 1520 \
● 1530 .eop sec
● 1540 lda Ylo
● 1550 sbc #04
● 1560 sta Ylo
● 1570 lda Yhi
● 1580 sbc #0
● 1590 sta Yhi
● 1600 lda Yhi
● 1610 cmp #&FF
● 1620 \Yhi goes negative at end of page
● 1630 beq finished
● 1640 .finished jmp scan
● 1650 lda #3
● 1660 jsr oswrch
● 1670 rts
● 1680 ]
● 1690 IF P%<base+256 THEN PRINT'"You must
● have made an error in typing in the
● code. Please check and try again.
● ":"VDU7:END
● 1700 REM set up jump
● 1710 base?0=&4C
● 1720 base?1=canon MOD 256
● 1730 base?2=canon DIV 256
● 1740
● 1750 COM$="SAVE ""CANONPJ"""+STR$^base+
● +100 "+STR$^base
● 1760 PROCOsccli(COM$)
● 1770 PRINT'"SAVING DUMP"+*";COM$
● 1780 END
● 1790
● 1800 DEFPROCfiling_system
● 1810 X%=&80
● 1820 Y%=0
● 1830 AX=0
● 1840 !user=USRosargs
● 1850 tape=(?user=1 OR ?user=2)
● 1860 disc=(?user=4)
● 1870 ENDPROC
● 1880
● 1890 DEFPROCOsccli($cli)
● 1900 XX=cli MOD 256:Y%=cli DIV 256
● 1910 CALLOsccli
● 1920 ENDPROC

```

## LISTINGS TO LISTEN TO

WE had a noisy postbag after our challenge to readers to invent simple routines that produced entertaining sound effects. Sadly, more than half of the programs didn't work! Here are our five winners, though, each of which earns a crispy blue note, as promised.

Two of them put a Sheene on their programming technique with a motorbike effect. Dunstable reader Robin Smith's program sets up a linear speedo on the screen to keep pace with the acceleration and deceleration, while Paul Riley's version kicks-starts and then works up through the gears. For the best effect, turn your computer chair around and straddle it.

Worcester must be one of the farthest points in England from the sea, which could be why S J Bates of that town sends a program so evocative of a holiday idyll. Pour yourself a Bacardi, close your eyes, and listen to the pounding surf...

From the sublime to the ridiculous with E R Osborne of Lowestoft's cheeky *Wolf Whistle*. And finally *The Tree* from Crispin Turville-Petre – mysteriously titled but mesmerising.

Any more?



```

10REM WOLF WHISTLE
20REM E.R. OSBORNE
30ENVELOPE 1,0,3,0,0,21,0,0,127,127,0,
    -127,126,126
40SOUND 1,1,140,5
50SOUND 1,0,0,6
60ENVELOPE 1,0,3,-2,-2,18,18,18,18,127,127,
    0,-127,126,126
70SOUND 1,1,140,10

```

```

10REM
20REM** The Tree**
30REM** by Crispin Turville-Petre**
40REM** piano and organ music **
50ENVELOPE 1,12,-12,-18,-45,90,255,255,
    127,-40,0,0,126,0
60ENVELOPE 2,11,-26,-36,-90,255,255,
    255,127,0,0,0,126,0
70SOUND 1,1,1,1:SOUND 2,1,1,1

```

```

10REM** MOTORBIKE **
20REM** by Paul Riley **
30ENVELOPE 1,1,3,0,0,7,7,0,126,0,0,
    -126,90,100
40FOR I=1 TO 3
50SOUND 0,1,83,12
60SOUND 0,0,0,5
70NEXT
80SOUND 0,-15,3,255
90A=INKEY(200)
100FOR G=1 TO 4
110READ S,F
120FOR J=5 TO F
130SOUND 1,0,J,0
140A=INKEY(5)
150NEXT
160A=INKEY(40)
170NEXT
180A=INKEY(100)
190S=J85
200FOR I=-15 TO 0 STEP .03
210S=S-.1
220SOUND 1,0,S,0
230SOUND 0,1,15,100
240NEXT
250DATA 40,180,100,120,100,180,110,185

```

```

10REM ** AUTOCAR ***
20REM ** by R. Boddie ***
30MODE 1
40VDU 19,2,2,0,0,0
50ENVELOPE 1,1,5,-20,-20,-20,0,0,0,1,1,200,
    0,0,126,126
60SOUND 0,1,255,1
70PRINT TAB(0,40)"SPEED=" MMPP
80PRINT TAB(0,60)"0 10 20 30 40 50 60 70 80
    90 100"
90 MMPP:PRINT TAB(10,100)"PRESS ANY KEY"
100I=21,0
110IF I<1 THEN
120PRINT TAB(0,100)
130FOR K=0 TO 250
140SOUND 1,0,K,1
150IF I < 100 SOUND 0,0,7,1 ELSE SOUND 0,1,7,2
160PROCSPEED(C)
170NEXT
180FOR S=50 TO 1 STEP -.1
190SOUND 1,0,S,1
200IF I < 100 THEN SOUND 0,1,2,2 ELSE SOUND 0,
    1,7,1
210PROCSPEED(0)
220END
230I=10,90
240EFFPROCSPEED(C)
250VDU 5
260CLEAR 0
270IF I > 400 AND C>2 THEN GOSUB 2
280IF I < 850 AND C<2 THEN GOSUB 1
290HLINE 2*50,30,860 PRINT "E"
300ENDPROC

```

```

10REM Seaside by S.J. Bates
20ENVELOPE 1,6,0,0,0,6,7,4,11,-7,0,-2,
    126,75
30ENVELOPE 2,0,0,-3,-2,0,3,21,50,-1,-15,
    -2,126,126
40REPEAT
50wave=RND(0)
60SOUND 0,1,wave+3,20
70length=RND(20)+40
80SOUND 1,000,0,0,length
90IF RND(2)>2 PROCkey
100UNTIL FALSE
110END
120DEF PROCkey
130num=RND(0)
140FOR mul=1 TO num
150SOUND 1,2,200,20
160IP num,1 SOUND 2,2,215,25
170IF num<3 SOUND 3,2,240,10
180NEXT
190ENDPROC

```

Paul Beverley's  
second probing  
into the inner  
workings of  
the BBC micro

# THE BEEB IN SLOW TIME

LAST month we looked at what the BBC micro is doing internally by using the 'bit-map' technique. This displays the lower part of the computer's memory on the screen, but many things happen so quickly that it is difficult to see what is going on – hardly surprising as the 6502 processor can execute up to a million instructions per second! A way is needed of slowing the whole thing down to the sort of speed a human being can appreciate. The most obvious way would be to slow down the system clock. Unfortunately, this is not possible because many functions of the computer depend on the internal clock, not least of which are the video system and the RAM.

Another technique is to generate a rapid succession of interrupts and spend so long servicing them that there is hardly any time left to do any normal processing. This is done by feeding a square wave into the NMI (non-maskable interrupt) input of the 6502 processor. Since we don't actually want to do anything in response to these interrupts, the service routine consists of a simple delay created by using a number of NOP (no operation) instructions.

The actual timings used in my prototype were as follows: interrupts were generated roughly every 15 micro-

seconds ( $\mu$ s), the interrupt service routine takes  $7\mu$ s (seven NOP instructions), the time the system takes to respond to an NMI is  $3.5\mu$ s, and then to execute the RTI takes another  $3\mu$ s. Thus there are only about  $1.5\mu$ s out of every 15 left for the processor to do its own processing. The actual timings can be adjusted by changing the number of NOPs and by altering the frequency of the square wave with a variable control.

A mere  $1.5\mu$ s processing out of every 15 suggests the system should work at about one-tenth normal speed, but in

**'A way is needed of slowing the whole thing down to the speed a human can appreciate'**

fact it is much slower because the normal IRQ interrupts on which it depends are still coming at the same rate as before and still take the same number of cycles to be serviced. This then takes up a much higher proportion of the available processing time. (In program 1 on yellow pages ix and x, I

have suggested that the ADC interrupts be switched off to reduce the number of IRQs and hence the likelihood of a system crash.)

You may wonder what happens when an instruction is being executed which needs more than three cycles of processor time ( $1.5\mu$ s). When an NMI occurs, the processor always finishes off the instruction it is executing before starting the service routine, so, if a six-cycle instruction is being executed, by the time the processor has finished it and dealt with the NMI, there is zero time before the next NMI occurs, in which case it cannot do another instruction until the end of the succeeding NMI routine. If the NMIs come too rapidly, the system cannot cope and the stack becomes corrupted, rendering the machine inoperable. The only way out then is to press the break key. The hardware is arranged so the pulse generator is disabled when break is pressed because it is when the PB0 line is low that the generator is enabled; but when the VIA is reset, PB0 becomes an input and hence the pull-up resistor has the effect of making the external circuit register a logic 1, ie fast speed.

Figure 1 overleaf shows the simple circuit used. It consists of two chips – a 7413 Schmitt trigger circuit which produces the square wave pulses, and a



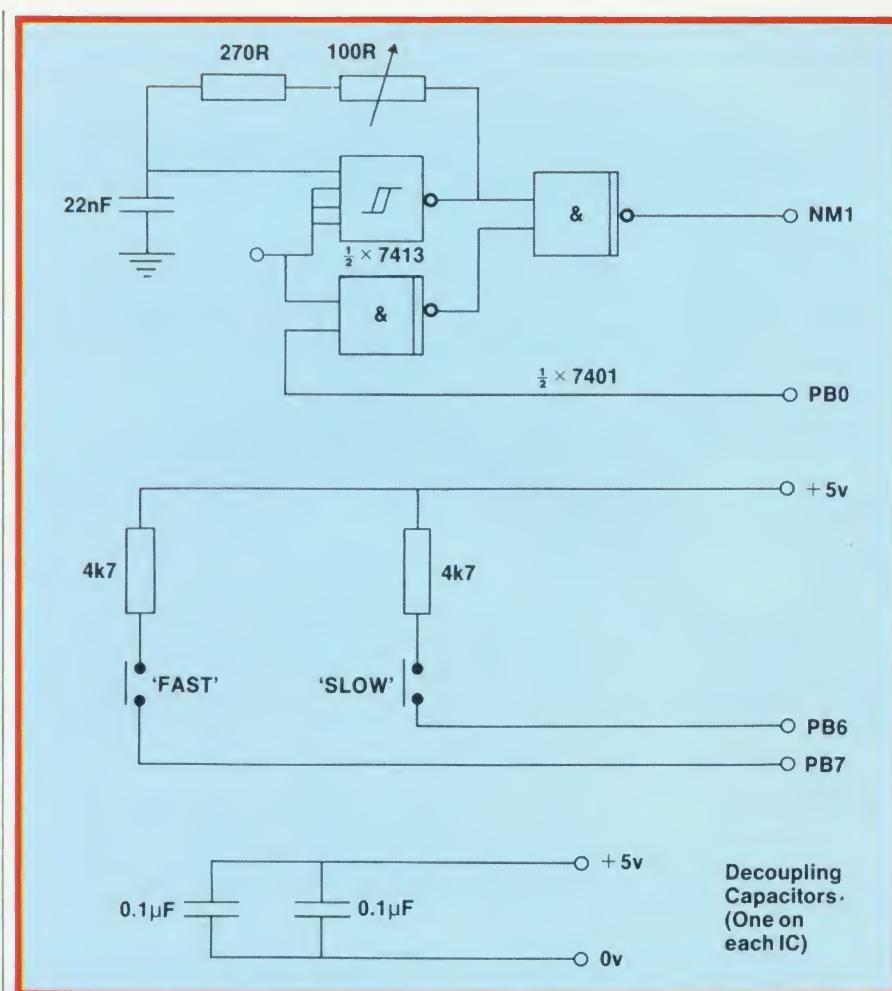


Figure 1. Circuit diagram for slow-speed BBC

7401 open collector NAND gate to enable you to switch the pulses on and off using one of the lines of the User Port (PB0). If you do not need the NMIs for anything else such as discs or Econet, you could make it even simpler by not bothering to use the open collector circuit and just driving the NMI line directly from the 7413. This works, but is not 'good practice', because you should only use open collector devices on the NMI line.

The circuit has to be connected to the micro through the user port. Unfortunately, although this provides almost all the lines needed, including the +5 volts supply, it does not give access to the NMI line. The only connectors on which this is available are the 1MHz bus and the disc interface, both of which use 34-way, IDC connectors. A 34-way connector and cable is expensive for just one line, so I suggest you solder a wire directly onto a component on the PCB (shock, horror!). You could solder to pin 3 or pin 8 of IC27 or direct to pin 6 of the 6502A. However, rather than solder directly to the leg of a chip, you can solder to the north end (ie nearest the back of the computer) of R81, the

3k3 pull-up resistor on the NMI line. This is situated along the west side of the 6502A. Unfortunately on earlier machines (up to and including issue 3) R81 is mounted vertically. Thus, if the resistor body is over the north hole, it makes it more difficult to get at something solderable. With a fine soldering iron, though, it should not prove impossible, and with issues 4 and 7 PCBs it is simplicity itself as the resistor is horizontally mounted.

One problem is that on some of the earlier machines there was a mistake on the printed circuit boards in the area of the NMI connection to the disc controller chip. This means that if you have an issue 1, 2 or 3 PCB and you are not already using disc or Econet, you would be well advised to check the voltage on the NMI line first. If it is less than 0.5 volts (ie logic 0) then you have problems and the safest way is to consult a dealer. One thing you could check though is that links S2 (Econet) and S9 (disc) are made with tinned copper wire and if they are not, then they should be fitted.

The only other hardware we are using is PB6 and PB7 for inputs to allow

us to signal the system to switch from slow to fast and vice versa. This is done because when the system is being fully stretched by the NMI interrupts, it often does not respond to the keyboard. Also, since we are using an IRQ routine to scan PB6 and PB7, the monitoring program does not need to be running to enable the user to switch speeds. Therefore, demonstrations can either be done using the main program or by typing in from the keyboard.

The program listing to run our little circuit consists of two main parts. The first contains the machine code routines for both the NMI and the IRQ interrupts. The NMI routine is a simple delay using NOPs, while the IRQ routine checks whether PB6 is grounded and, if so, switches to slow speed and, if PB7 is grounded, switches back to fast.

The second part is the Basic demonstration routines. These allow you to set up various test situations by single key presses. As you play with this system you will find other things to demonstrate and add to the program, but as it stands, the software sets up the following keys:

**0-7:** To switch between the different modes you can use the number keys, 0 to 7.

**F:** Pressing this key allows you to fill up the screen with characters. The key pressed after the F is the character used for filling the screen, except that pressing R produces a set of random characters, and A produces sets of the alphabetic characters.

**W:** This is a 'wait' function. It allows you to enter other keystrokes, but does not act on them until PB6 is pressed. In fact, it waits until the IRQ routine has responded to the pressing of PB6 and has set PB0 low. When you press PB6, the system switches to slow speed and the keyboard no longer responds, but the characters previously entered are already in the keyboard buffer and will therefore be acted on by the system at the slow speed.

**Z:** This key puts the micro into mode 6 and displays the bit map we discussed last month. However, doing so wipes out the program! Therefore you must enter or load the program at &2000 by setting PAGE = &2000 first. You should notice in this mode that as you switch from fast to slow a white marker appears and disappears in the middle of the screen.

**T** and **G** are used to define a text and graphics window respectively.

Here are a few other suggestions. The letters in quotation marks are the key-

page 87 ►

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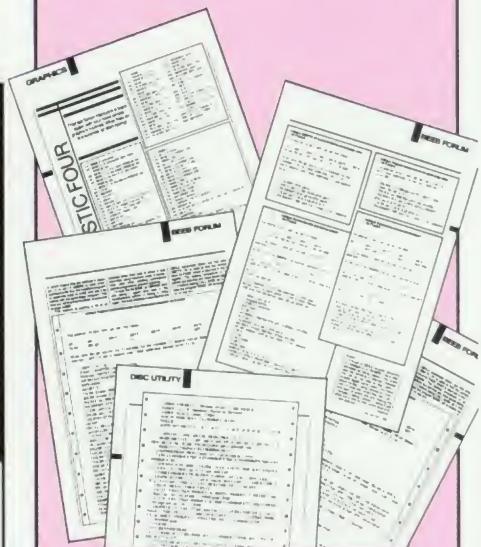
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The tapes come with BBC programs on one side and Electron programs as the other, so it shouldn't be possible to mix the two. Just turn to pages 177 and 178.



**Save yourself  
the time and  
bother of typing  
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listings**



**SWORD MASTER** is one of the few two-player games around, and is designed for joystick or keyboard.

Sword Master by Ken Worrall is based on the fencing rules written in 1190 by Herman von Salza for the Deutschritter Order of Teutonic Knights. It features full-colour machine code animation of a sword duel between the players shown on screen as knights.

Full instructions, music, sound effects, player rankings (from Greenhorn to Swordmaster) and a roll of honour (which can be saved) are all included. The game also closely reflects the rules, style and dress of the Deutschritter Order.



**TREK** was the first game to take advantage of voice synthesis on the BBC micro – and uses joystick or keyboard.

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The game has been extensively developed from Tim Heaton's famous Trek III. It barely fits into 32k.

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TURN  
TO  
PULL-OUT  
CARD  
PAGES  
**177/178**



◀ page 83

strokes needed to achieve the particular effect, and statements like 'CTRL-L' mean you hold the CTRL key down and press L. This produces a control code which, in the case of CTRL-L is 12 which clears the screen. After each combination of keystrokes, press PB6 to initiate action on those commands typed in after the W.

'0 F X W CTRL-L': Go into mode 0, fill the screen with Xs and then clear the screen. The screen is cleared neither from top to bottom nor from bottom to top, but by clearing the first byte of each page of memory, followed by the second byte of each page and so on. If you try CTRL-P instead of CTRL-L, ie do a CLG, you will see that it clears from the top down and, by comparison, takes a very long time. If you get tired of waiting, press PB7 and go back to full speed.

'0 F R W 7 0': Having filled the mode 0 screen with random rubbish you can, in slow time, watch it being cleared as mode 7 is selected. As it goes back to mode 0 it produces a very strange display in the interim, the screen splitting into four sections. This is presumably due to the processor re-programming part of the 6845 CRT controller, then working something else out, then finishing off the re-programming. The only explanation I have is that it may get held up as it tries to alter the C0 and C1 lines which changes the 'hardware wraparound' for the hardware scrolling. The internal VIA operates at 1MHz rather than 2MHz and therefore may be even more tied up by the excess NMIs. But that is only a theory.

If you want to see what is meant by 'hardware scrolling', go into mode 0, press escape and list the program. When the listing reaches the bottom of the page and is about to start scrolling, press PB6. You will see that each time

the screen scrolls, the top line appears momentarily at the bottom, is wiped out and then overwritten by the new line of text. If you try this again with a text window defined from within the program either by using T or by going into the zero-page bit map by using Z, you will see software scrolling. Starting from the top of the screen, each line is copied on top of the one above, the bottom line is wiped out and then the new line is written in. This is a laborious process and hardware scrolling does save a lot of processor time.

There are many things that can be done by using control codes. Page 507 of the *User Guide* will show you what they all are, but for example you could draw a filled triangle as shown in program 2.

Even if your machine uses disc or Econet, you will still be able to use these interfaces in the normal way as long as the pulses are switched off. The circuit is designed so that when switched to fast speed, the NMI line is available for normal use by other devices. It does not matter that you have over-written the NMI routines in PAGE &D00 since as soon as a disc function is called for, these routines are re-written into RAM by the disc filing system (I presume the same is true of Econet though I have not tried it).

A word of warning. It is possible to simplify the pulse circuit even more if you are prepared to disconnect the circuit manually before using the disc system. However, in the development stages I was doing just that, but on one occasion forgot to disconnect the pulses while trying to save the program onto disc. The result was a disc that was so badly corrupted that not only

was I unable to read track and sector using *Disc Doctor*, but what is more, when I had given up the idea of rescuing the other programs on the disc, I could not even get it to re-format without generating errors! In the end I had to wipe the whole disc with a tape-head de-magnetiser. That did the trick - I was then able to format it again.

This technique can also reveal an obscure design fault in the 6502 microprocessor. Apparently, if an NMI happens to arrive just as the processor is finishing off an IRQ service routine (during the last cycle of the RTI, I believe) it does not finish off the instruction properly, thereby corrupting the stack. The chances of this ever happening during normal operation of a 6502-based system is literally several millions to one against. However, because we are stretching the system to its limits, we should not be surprised if it hangs up on us occasionally. The remedy is simply to press BREAK, which is programmed to restore things.

If in using this method, you do discover anything of interest, or anything you do not understand, write to the Editor and let us know. We may be able to find an answer, and in any case it is interesting to have some feedback to let us know that people are actually using our project ideas.

*Next Month* we turn our attention to the random number generator that is contained within the Basic ROM. How does it work? How good is it? Can it be used from machine code programs? We will also be looking at a piece of simple hardware to go on the user port that will provide a high-speed supply of random numbers.

ctrl-P	(Clear the screen)
ctrl-Y	(= PLOT)
ctrl-@	(= PLOT 0 i.e. MOVE)
[or use ctrl-E (PLOT 5 i.e. DRAW)]	
ctrl-@, ctrl-B	(X co-ordinate = 512 = &20)
ctrl-@, ctrl-C	(Y co-ordinate = 768 = &30)
ctrl-Y, U	(Draw a triangle = PLOT 85)
ctrl-@, ctrl-D	(= 1280 = &40)
ctrl-@, ctrl-@	(= 0 = &00)

Program 2. Manual program for drawing a filled triangle

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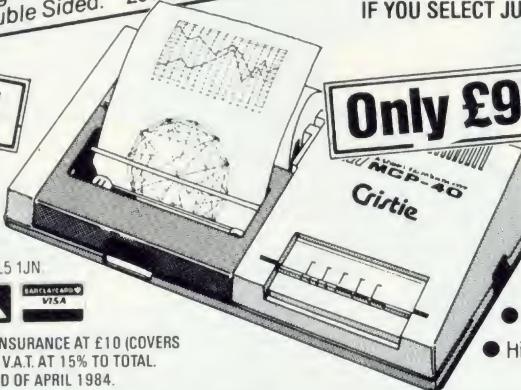


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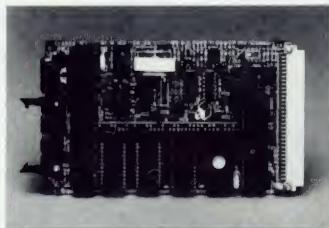
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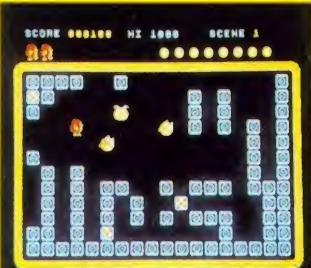
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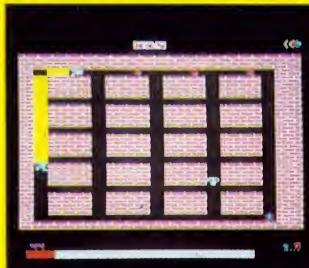
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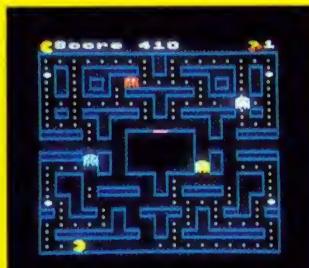
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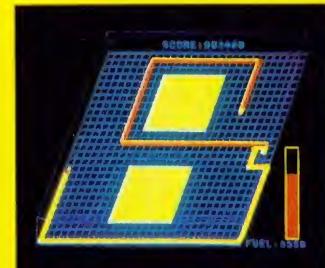
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**OUR GUARANTEE**

# MY BLUE HEAVENS

Peter Vasey brightens up the background

92

**H**ere is a neat method for changing the background colour of the screen when running protected software. A frequent problem with commercial programs is that protection techniques prevent the user from changing features such as sound effects and colour. This short routine shows how the difficulties can be overcome.

Type in the program and save it onto disc or cassette without running it. Once you have done so press Break and then type MODE 5. Notice that the background colour of the screen has changed to blue.

To understand how it works, look at the listing once again. Line 110 sets the VDU vector at &20E,20F to point to the new routine. Line 130 then waits until the VDU drivers are sent the MODE 5 command. When this happens the machine-code equivalent of VDU 19,0,4,0,0,0 is executed (lines 150 to 180) and the VDU vector is then returned to its normal state (line 190). Lines 250 to 270 are included to allow disc users to auto-start programs with SHIFT/BREAK.

If you prefer another colour to blue, simply change the '4' in line 170 to the appropriate colour code.

This technique was originally designed for *Aviator* but it can be applied to most software and with a little modification more complex effects can also be achieved.

```

10 REM ****
20 REM BLUE HEAVENS! by Peter Vasey
30 REM ****
40 REM DISC/CASSETTE
50 REM Press BREAK to activate
60 REM for cassette version
70
80 FORN% = 0 TO 3 STEP 3
90 P% = &A00
100 LOPTN%
110 LDA#&B: STA&20E: LDA#&A: STA&20F
120 RTS
130 CMP#5: BNEnotyet
140 JSR&E0A4
150 LDA#19: JSR&FFEE
160 LDA#0: JSR&FFEE
170 LDA#4: JSR&FFEE
180 LDA#0: JSR&FFEE: JSR&FFEE: JSR&FFEE
190 LDA#&A4: STA&20E: LDA#&E0: STA&20F
200 LDA#247: LDX#0: JSR&FFF4
210 LDA#0
220 .notyet JMP&E0A4
230 ]
240 NEXT
250 *FX247,76
260 *FX248,0
270 *FX249,10

```

# STOP PRESS

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Cumana BBC Microcomputer compatible disk drives: retail prices

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Cumana disk drives with independent power supply, mains lead and plug. Excluding other accessories.

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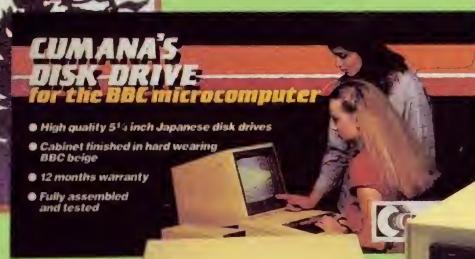
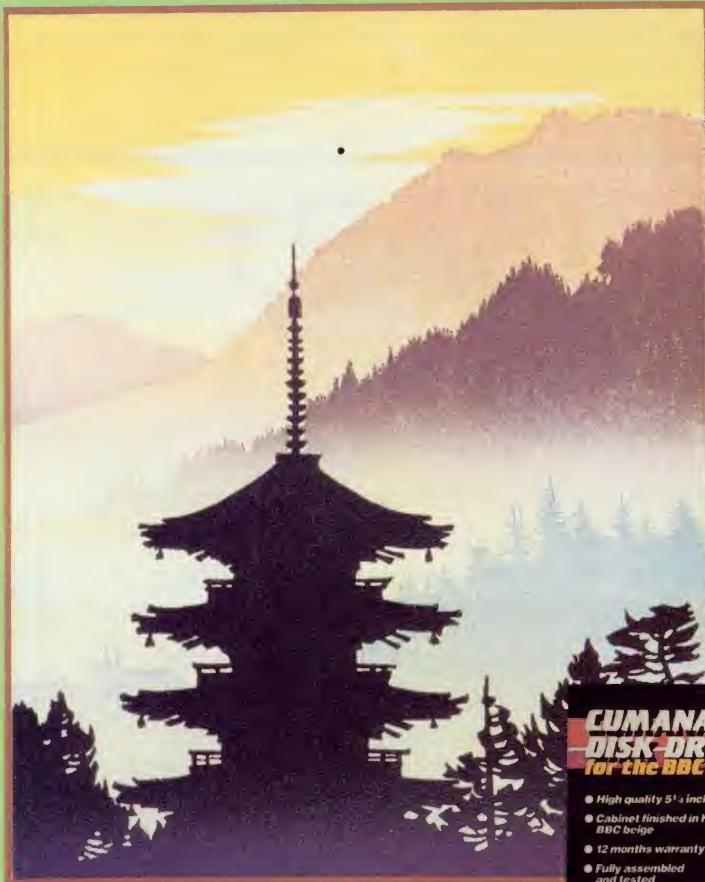
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**ACORN USER'S**

# ANNIVERSARY COMPETITION

94

THIS issue marks the second anniversary of the launch of *Acorn User*. To celebrate the event here is a special birthday quiz open to everyone to enter. It's designed to test your general knowledge of computing and computers, and almost all the answers to the questions have appeared in the pages of the magazine within the last two years. We're giving away no less than 20 first prizes of five packs of software (three for the BBC micro and two for the Electron), worth about £40. Ten runners-up will receive an *Acorn User* sweatshirt. See panel below for details.

1

What is the meaning of Basic?

- a) Just a nice name for a language designed to introduce newcomers to computers.
- b) Beginners' All-purpose Symbolic Instruction Code.
- c) Beginners American Standard Interface Code.

2

Was the first home computer in the UK to be sold at under £100:

- a) the ZX80?
- b) the ZX81?
- c) the Acorn Atom?

3

On a BBC micro how many elements are there in an array created by the Basic statement DIM A\$(20,2)?

- a) 40
- b) 42
- c) 63

4

On a BBC micro, is a bit:

- a) half a byte?
- b) a binary digit?
- c) one of the pins on a silicon chip?

5

Did the first issue of *Acorn User* appear in:

- a) January 1982?
- b) July 1982?
- c) November 1982?

6

Was the original name of the BBC micro:

- a) Quark?
- b) Proton?
- c) Neutron?

7

How much RAM does the BBC model A have?

- a) 8k
- b) 16k
- c) 24k

8

A colour monitor:

- a) checks that the high-resolution graphics on a computer are working?
- b) gives a better picture than the average TV set?
- c) enables you to use your computer to switch between different TV channels?



## HOW TO ENTER

Select your answers from the categories a, b and c in each question (for example 1a, 2c, 3b, etc), complete the 'tiebreaker' sentence and send your entry on a postcard to July Competition, *Acorn User*, 68 Long Acre, London WC2E 9JH to arrive not later than Friday, August 3, 1984.

## PRIZES

Each first prize will be made up of the top five packages listed in this month's software chart (see page 145): 'Snooker' (Visions) and 'Hopper' (Acornsoft) for the Electron, and 'Twin Kingdom Valley' (Bug-Byte), 'White Knight II' (BBCSoft) and '747 Flight Simulator' (Dr Soft) for the BBC micro. Ten runner-up prizes of an *Acorn User* sweatshirt will be awarded.

We regret that no correspondence or negotiation can be entered into regarding the competition or prizes – only postcard entries will be accepted.



**9** Which screen mode in BBC Basic does the Electron not work in?  
 a) mode 0  
 b) mode 2  
 ✓c) mode 7



**10** Which of the following is an interactive or two-way system:  
 ✓a) Prestel?  
 b) Ceefax?  
 c) Oracle?

**11** *Snapper*, *Rocket Raid* and *JCB Digger* are all games written by Jonathan Griffiths. Who are the publishers?  
 a) BBC Publications  
 ✓b) Acornsoft  
 c) Micropower



**12** A modem is:  
 ✓a) a device which enables a computer to communicate with another computer down a phone line?  
 b) a computer which runs full CP/M?  
 c) a computer which acts as a terminal to drive another computer?

**13** ASCII means:  
 a) the second, upgraded version of the American Standards for Computers recommendations?  
 ✓b) American Standard Code for Information Interchange?  
 c) a coding system based on the name of its inventor?

**14** Sargon is:  
 a) an adventure game?  
 b) a chess program?  
 c) an interface?

**15** In hex, B392 is the decimal equivalent of:  
 ✓a) 45,970?  
 b) 43,298?  
 c) 46,026?

**16** Charles Babbage's 'Analytical Engine' is:  
 a) a 19th-century forerunner of the computer?  
 b) an early computer developed at Manchester University around 1946?  
 c) A device which allows you to tune a car by means of a BBC micro?

**17** In a standard flowchart for a program what does this sign (right) mean?  
 a) the beginning or end of the program  
 b) an input or output operation  
 ✓c) a decision-making operation



**18** Information Technology Year was:  
 a) 1981?  
 b) 1982?  
 ✓c) 1983?

**19** Which one is Chris Curry?  
 Picture a  
 Picture b  
 Picture c



a



b



c

**20** Complete in not more than 20 words the following sentence:  
 I like Acorn User because ...

## MARCH/APRIL COMPETITION WINNERS

HERE are the answers to the March and April competitions. Both involved putting up with the appalling Mad Alex - well, we all have to sometimes... In the **March** competition it was apparent to most of you that Alex had talked the most demented drivel. Those of you who weren't driven around the bend worked out that, yes, the kitty does

work and the highest value the coin could have would be 700 addisons and the lowest 27 addisons.

In the second part, the occupations of the four newly elected committee members were as follows:

Anthony - Graphics consultant  
 Bartholomew - Machine-code programmer  
 Christopher - Designer  
 David - Hardware expert

The winners, who each receive £20 worth of Acornsoft software, were M English of High Wycombe, Bucks; D Moore of Birkenhead; and F M Cameron of Hereford.

In the **April** comp the amount Alex owes you after your sojourn through the dungeon is 19,700 gold pieces (19,712 if you include your entry money). About half of you got this right.

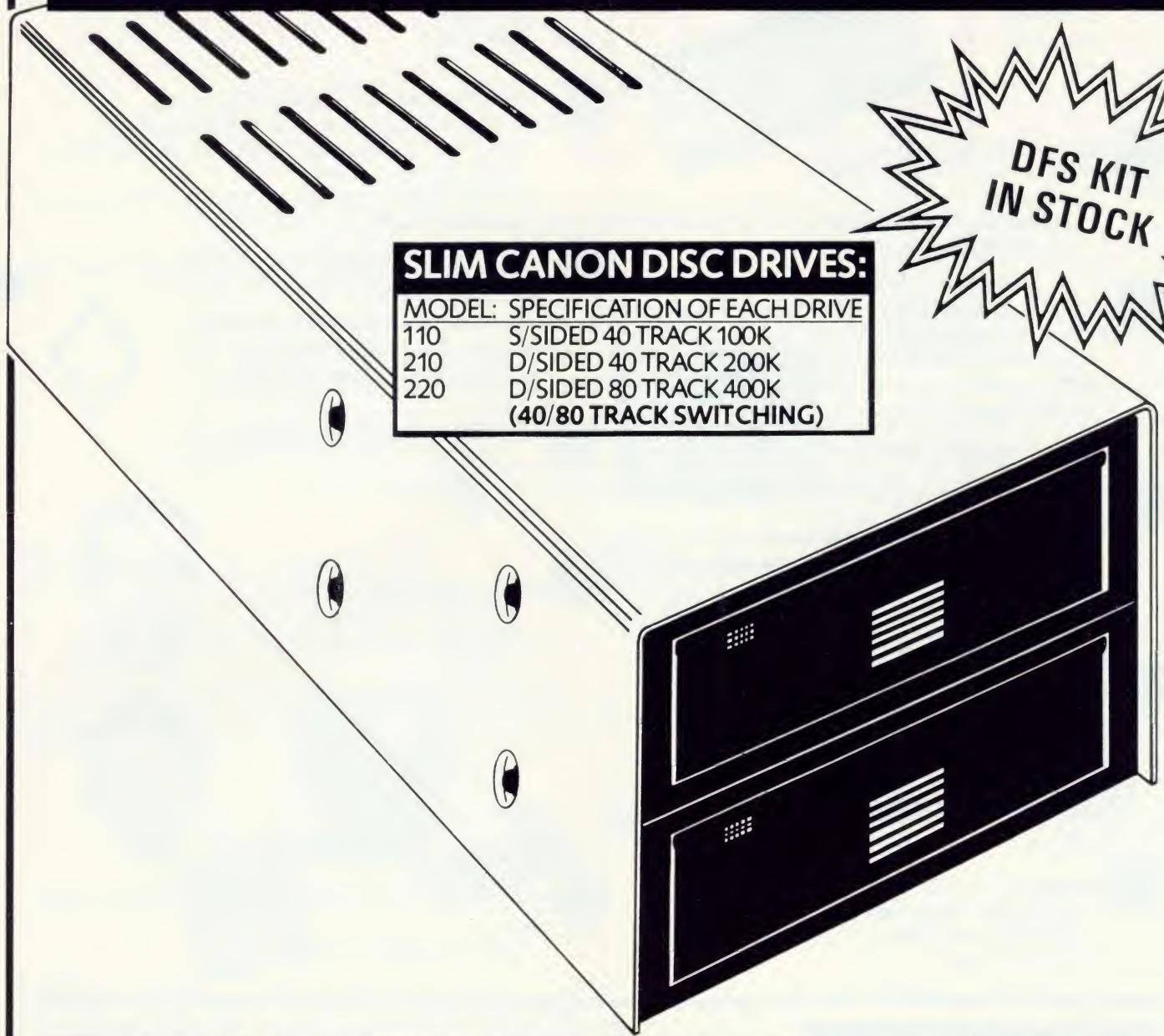
The winners were Andy Cowan of Birmingham, David Westbrook of Oxford, and S Jhawar of Stockton-on-Tees. They have been sent £20 worth of Acornsoft software.

Those of you who continue to send in lengthy descriptions of Mad Alex's genetic make-up do so at your peril: rumour has it that he has perfected a technique of electrocuting his least favourite people over the telephone line. You have been warned...

As usual, the best entry came from Frank Dashwood of Edinburgh, whose scribbles were composed on the back of an enormous poster advertising a wine called Bull's Blood - Mad Alex's favourite tipple!

For wit and humour beyond the call of duty we're awarding a special prize to Mr Dashwood - a fiver to buy himself a bottle of the red stuff.

# CHASE DATA



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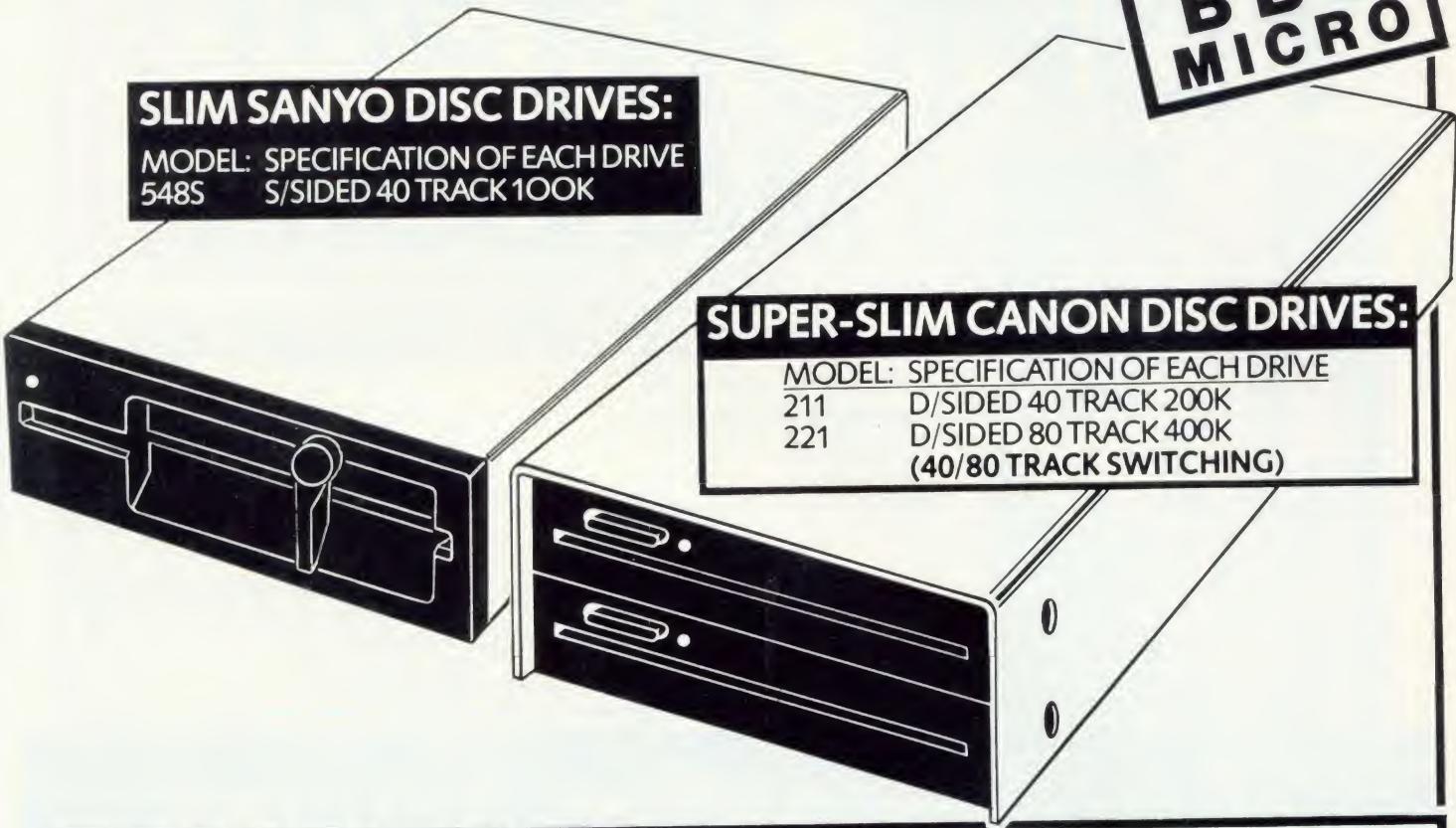
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to BBC Microcomputer users with a minimum configuration of 1 x 40 track single sided disc and an 8" 132-column (condensed mode) printer, to a maximum configuration of 2 x 80 track double sided disc and a 15" printer. The programs allow user allocation of each file between "DRIVE0, 1, 2 or 3, thus making full use of the disc space available. HMS HOME ACCOUNTS allows all financial transactions within a defined environment to be recorded, printed and analysed. Accounts may be reconciled with statements or passbooks, uncleared entries being highlighted. Depending on the analysis structure you choose, the system can keep track of anything from answering "how much is in the piggybank?" to independent tracking of multiple bank accounts, credit cards, building society accounts and cash in hand. The only reason for keeping home accounts in any form is to have your current financial state apparent on demand and reconcile statements received in order to find out where the money goes. This program is designed expressly for these requirements. You wouldn't keep them if these areas were of no concern, and being of concern you want to keep them thoroughly and effectively. HMS HOME ACCOUNTS allows this.

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Both systems allow for 1000 to 10000 records per file depending on configuration and use, and initialise on shift-BREAK without user OS intervention. Fully documented source listings and optional user-modifiable VIEW text operating documentation are included on the master disc, and hard copy manuals are provided.

HMS BASIC ENVIRONMENT is specifically an aid to BASIC program development designed to encourage the creation of well-structured readable code in circumstances where memory becomes a constraint. Procedures to handle screen I/O, cursor switching, CLI invocation, and keyboard validation are provided, with a linking BASIC source file compressor which includes variable name compression to two bytes. The ability to link as many BASIC source modules as desired into a single condensed running version resolves the coder's conflict between space and intelligibility: 60% compression is effected on our sources for the above accounts packages.

The disc, manual and information contained are sold under license subject to the condition that they are for single user single site application by or on behalf of the purchaser, are not for resale in whole or in part either as originals or copies, and may not be supplied to a third party as part of a package or used as part of a package supplied by a third party to the purchaser, without the written consent of the copyright holders. Damages will be claimed where this occurs, with revocation of license. Purchase indicates acceptance of license terms.

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This ROM based word processor has many advanced features including macros, still one of the best available on the market.

Acorn Spreadsheet Viewsheet	£59.00
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A new spreadsheet from Acornsoft comes in a 16K ROM with a comprehensive manual, it is compatible with View and the 6502 2nd processor.



All prices include VAT and delivery

# THE MONEY PROGRAM

John Vaux picks the Accountant out of the Z80 second processor bundle and renders this account

THE Z80 second processor is a unit which connects to the BBC micro-computer via the Tube interface. The hardware and software was summarised last month, and this and subsequent reviews will concentrate on the software 'bundled' with the second processor. Bundled software is a new trend whereby programs are provided apparently free with an item of hardware. Nothing is really free of course, but if you add up the total normal price of the software it can come to a surprisingly high figure. If you have a use for the majority of it then it is well worth having.

Acorn's Z80 second processor comes with the packages listed in figure 1 overleaf, and the total value of all this lot if bought separately at retail prices would be over four times the price of the second processor!

The software comes on a total of seven discs, all fully documented in a set of matching manuals of very good quality. A special program called *Prepare* is provided to help you produce working copies of whichever programs you wish to use. This program is fully menu-driven with good prompts at all stages telling you what to do. If you generate all the software you finish up with 12 working discs. This program was quite impressive and augured well for the professional quality of the rest of the package.

## ACCOUNTANT

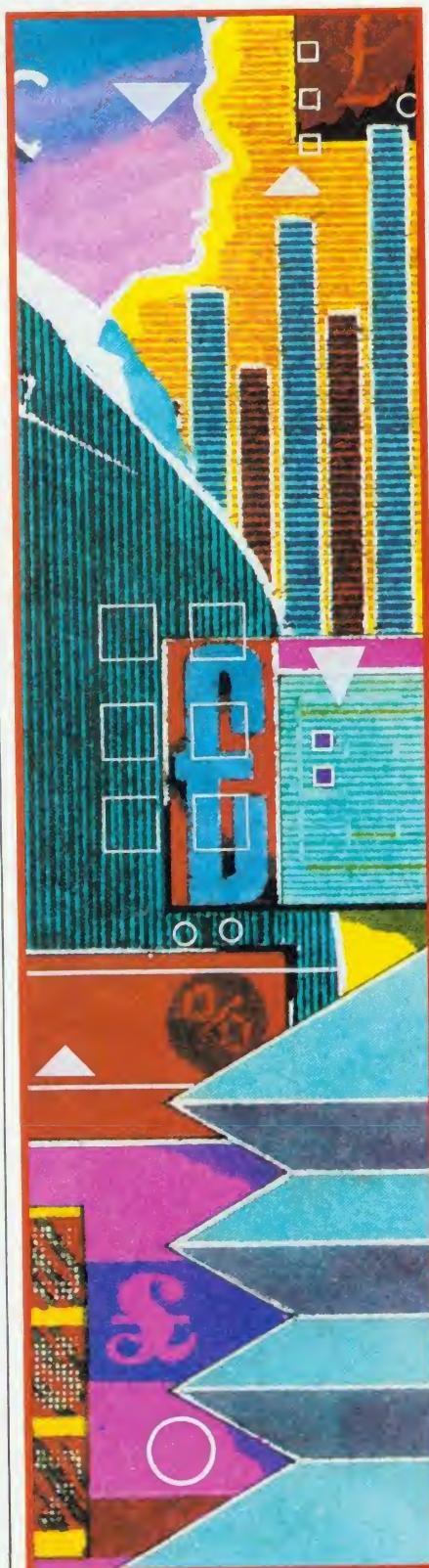
This month we look at the book-keeping program called *Accountant*, written by Compact Software International, which is well-proven on other Z80 business computers. It is a simple system based

on sales and purchase daybooks and a nominal ledger, from which a range of management reports can be obtained. Extra software can be bought to expand it at a later date to a full integrated accounts suite with sales ledger, purchase ledger and stock control.

The package lives on three discs: a start-of-day disc, main program disc and data disc. It runs on twin disc drives (2 x 400k), although if you have small data files it would be possible to run it on one drive. The system is started by inserting the start-of-day disc in drive A and keying in START. All this does is ask for today's date and then tell you to load the program disc in A and your data disc in B. The sequence seems a bit strange and got a bit annoying after a while. One could have expected this to be incorporated on the program disc, thereby saving a disc change.

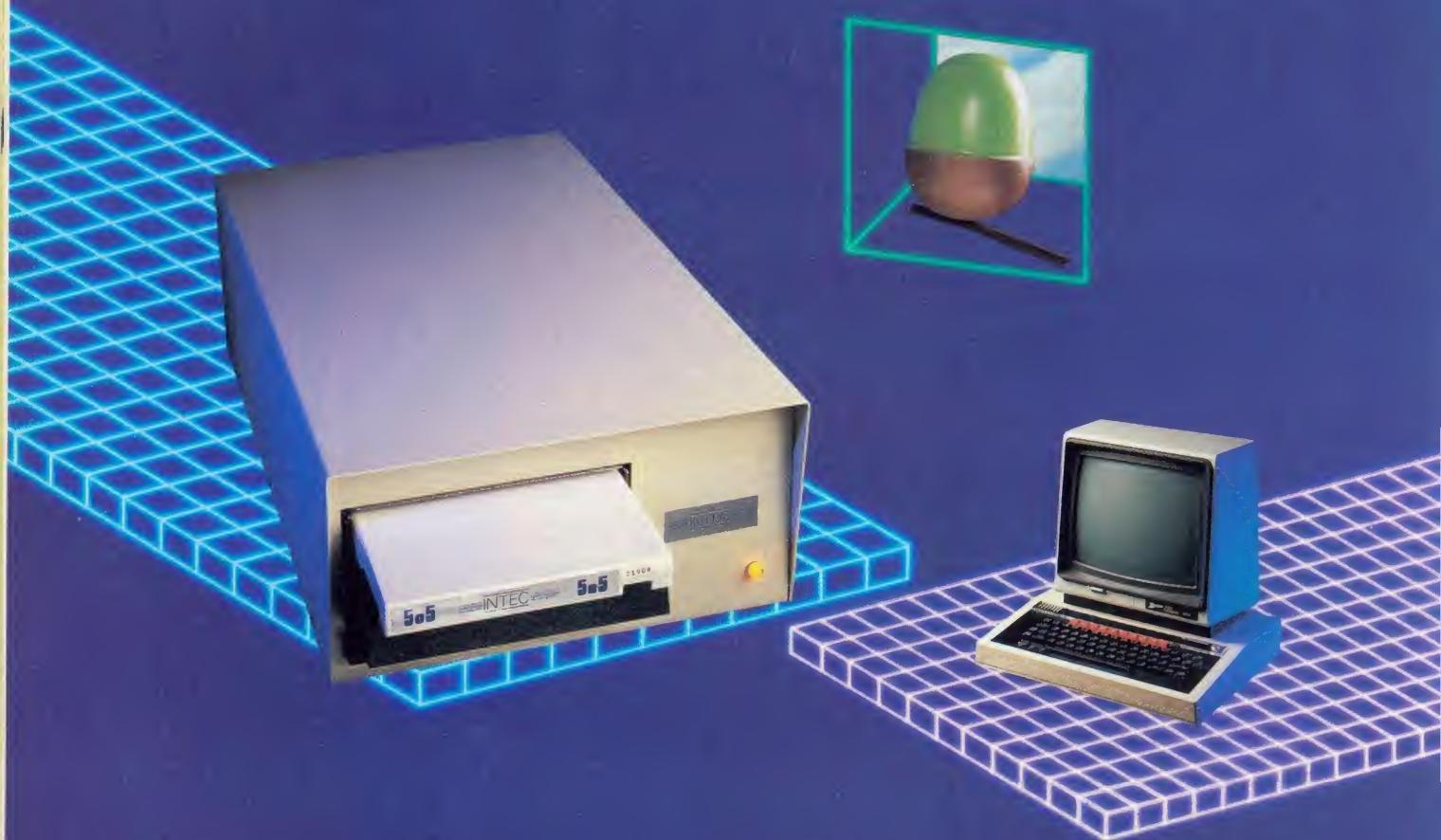
## Nominal ledger set up

The first thing to do in any accounts package is set up a set of nominal codes in a logical manner to ensure the ability to produce meaningful management reports. This can be quite a problem for the beginner and it is therefore a pleasant surprise to find that *Accountant* has a sample set of codes already set up, which can be modified as required for your particular business. A full description of this excellent idea and an explanation of the code structure provided is in the manual. In fact, a full set of files is provided so you can dive straight into trying out the system. When you have finished getting to know the system these may be regenerated from the *Prepare* pro-



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gram or a blank set may be generated using an option in *Accountant*. If you try to do anything without having created any data files it soon tells you!

Certain nominal ledger control accounts must be present for the system to run. The codes for these must be entered on a control file which also contains your company details (name, address, etc.) and VAT codes and rates and your period end, year end and VAT dates. Facilities are also provided for entering budgets against nominal codes and also group codes for further analysis.

### Journal entries

Direct posting to the nominal ledger for such things as opening balances, petty cash, adjustments, etc., is done in batches using the 'journal entries' option. The batch technique enables easy checking that all entries have been made by reconciliation of a manually-calculated batch total with one generated by the computer. It also gives a better audit trail for checking by auditors or VAT men. A printed copy is always produced for any posting.

Taking the 'journal posting' option on the screen menu display brings up another screen for entry of the details. Entered dates are always checked for validity, and a check that entered nominal codes are on the file is made at time of entry. Amount entries are only allowed through if they are numeric.

At this point a slight criticism must be made. If you have made an entry and wish to change it, only the newly-entered characters are taken, even though the old ones are still displayed. For instance in a description, say the original entry was WWIDGETS and it should have been WIDGETS: when you key in the correction the field will show as WIDGETSS but will enter correctly. This is even more confusing in amount fields. Say you had entered 1000 and it should be 100. Values are moved to the right of the field by the system, so it will show as several blanks followed by 1000.00. When you enter your correction it will show as 1001000.00 - which it will correctly pick up. If you blank out the 1000.00 the system will reject the entry because it objects to blanks in numeric fields. It would be better if the field was cleared when you start entering new data, as it is in some cases when re-entering an invalid nominal code.

### Daybook entries

The 'purchase daybook' option handles purchase invoices, credit notes, cash purchases, and so on. Again, all input is

batched giving a check that all documents have been entered.

Defaults for dates, description and nominal code can be entered which will be offered as the value for each line and can then be changed if required. Net amount, VAT amount and gross amount must all be entered, although VAT is not calculated. Each item may be split across additional nominal codes if required. At the end of the batch the totals are checked. If they disagree you have the option to either correct the batch total, step through the items looking for the error, or abandoning the batch.

On acceptance the audit trail is printed and then the nominal ledger is updated with the details.

'Sales daybook' entries are made in a manner almost identical to those for the purchase daybook. One difference noticed is in the cash sales option. Here the system can be made to calculate the net amount from the gross by omitting the entry of a net amount.

### Reports

Several types of report can be generated, including:

- Account enquiry to show details of any nominal account and transactions.
- Trial balance with or without period balances.
- Transaction listing showing full details of all transactions for every nominal code.
- Budget/variance report showing performance against budget for current period and year-to-date. The variance is shown as pounds difference and also as a percentage difference.
- Formatted trial balance based on group codes.

## THE Z80 BUNDLE

- CP/M operating system with the GSX graphics extension. This is the standard operating system for eight-bit business micros and should give access to the enormous range of programs already available for that system provided they are made available on BBC format discs.
- Z80 version of BBC Basic.
- Professional Basic Similar to Basics from Microsoft and Digital Research.
- CIS Cobol Popular language for writing business software.
- FilePlan Card-index type system for storing data for rapid indexed retrieval.
- GraphPlan Financial modelling program or spreadsheet.
- MemoPlan Word processor.
- Accountant Book-keeping program.
- Nucleus Program generator.

After all reports for a month have been done, the month end routine must be run. This clears all individual transactions and carries the balance into the next month. At year end further balancing is performed and specified accounts set to zero.

### CONCLUSIONS

The whole program has been specially adapted for the BBC micro, and seven of the BBC's function keys are used. Luckily f9 is not included as this is adjacent to the break key - and inadvertently hitting that drops you out of the program and back to Z80 Basic. A book of function key strips is provided, one for each piece of bundled software.

The system is rather slow in operation. Loading a new program module in or changing a menu option takes from 10 to 30 seconds. Even passing from the heading level to item entry level on the screen takes about 30 seconds. Updating of the data files also is rather slow, typically about 20 seconds per item in a batch: as there can be up to 200 items per batch this could take a very long time. The conclusion is to keep batches small, say up to about 20 items.

Apart from deliberately hitting the break key, it was not found possible to 'crash' the system in normal operation. Ridiculous input such as wrong dates or enormous amounts were trapped with an appropriate message.

The documentation appears excellent on initial perusal. However, having read it from cover to cover it does not appear to be in the best logical order. The beginner will find himself hopping about from one chapter to another, and possibly not getting back to where he was.

The layout of the printed reports is very good. The main heading of each report is in wide print to make it stand out and pages are properly numbered with totals appearing where appropriate.

To place the above criticisms in perspective, this software is well up in the league of better accounts packages for microcomputers. It is obviously intended for the smaller business with not too many documents to be input as it is not one of the fastest systems for data input. Having got the data in, the enquiry and reporting facilities are fast and give very good information.

To summarise then; *Accountant* is well-written, well-documented and proven. If the rest of the software provided with the second processor is as good (and I know some of it is) then the total package is excellent value for money.

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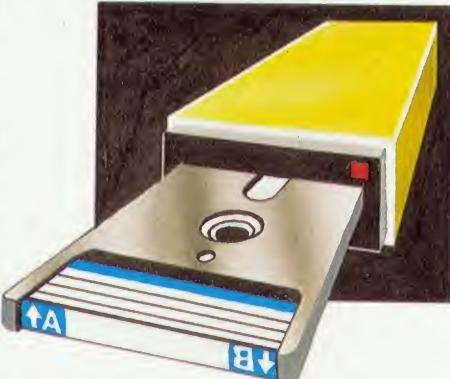
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# MANAGEMENT BY MENU

Ian Rowlings test runs StarBase

'StarBase', GCC (Cambridge) Ltd, £69  
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**S**TARBASE is a ROM/disc-based data management system that is a truly professional tool. It is supplied with a 16k ROM, fitted in the usual manner, and a 40/80 track disc containing applications and extension software (51k). It is essentially menu-driven and makes extensive use of the function keys to provide the necessary functions. The manual is also comprehensive and explains not only how to use the system but also how it works.

Each file created can contain up to 4096 records. A record may consist of up to 69 fields, each of which can hold up to 255 characters of alphanumeric data. The maximum record size is 920 characters. The database capacity, that is to say the maximum file size, depends on the disc system used—a double-sided, 80-track drive will allow a file of 396k, almost full capacity; a single-sided, 40-track drive obviously allows proportionally less.

When you have formatted a disc to hold your database you are ready to start. Once you've mastered the structure of the system, its menus and function keys, it is easy to use. Calling \*STARBASE provides the initial menu:

```
C CREATE
F FILE
Q QUIT
```

Pressing 'C' provides the 'CREATE' menu:

```
<f0> Initialise disc
<f1> Build input form
<f2> Review disc
<f3> Re-date disc
<f4> Re-name disc
```

<f0> should not be confused with physical disc initialisation; it initialises the system and creates a file in the form you require. At this stage you are prompted for the user name, date and disc configuration, etc. You can also enter a password for security purposes. It can take a while to initialise and a useful tip is to \*BACKUP the disc after initialisation so that, without having to repeat the procedure, you have blanks available for future use.

<f1> provides a subsidiary level 2

menu which is used to design the record structure. Once construction is complete the file structure can't be modified. Other calls from this menu allow review of the file structure and certain minor modifications.

The second, level 2 menu accessed from the main menu is the 'FILE' menu:

<f0>	INSERT
<f1>	AMEND
<f2>	DELETE
<f3>	BROWSE
<f4>	SORT
<f5>	SHORT FORM
<f6>	SELECT SUBSET
<f7>	SAVE SUBSET
<f8>	LOAD SUBSET

This is used for manipulating data once the file has been created. Each of these calls in turn provides, where appropriate and controlled by the function keys, the additional facilities that, once mastered, make the data management easy. All the normal functions you would expect of a professional system are provided, including useful additions to make the work quicker and easier. For example, calling <f5> allows you to select and thus restrict the fields on which the other functions are to work. It is surprising, given that you have a lot of work to do in particular fields, how much time this can save.

<f6> works in a similar manner, allowing you to restrict the work carried out on a subset of records of your choice, and provides the following Create Subset menu:

<f0>	Finished
<f1>	All records in file
<f2>	No records (Clear)
<f3>	Record by Keysearch
<f4>	Add to subset from file
<f5>	Select from Subset

When you select any of these you are prompted to enter the value or value and test condition by which the subset is to be defined. A wildcard facility allows selection of any specific value in any field. Such subsets may be manipulated with the other functions, including saving onto another disc. Sorting (descending or ascending) uses the Shell-Metzner method, which is very fast, and it can be based on the contents of up to five fields.

In addition to the facilities dealt with so far, there are other utilities and applications software on disc. Booting this provides the following menu:

- A SBU01 Recover deleted record
- B SBU02 Increment field
- C SBU03 Field statistics
- D SBU04 Configure printer
- E SBU05 Print file review
- F SBU06 Print record cards
- G SBU07 Build print format
- H SBU08 Print address labels
- I SBU09 Printformat

Option B allows you to increment or decrement the value of a particular field. The destination field need not be the same as the source field, and it can be used in conjunction with either numeric or alphabetic fields.

C allows you to calculate a total and average value of a specified field in a defined subset.

Booting the disc provides default settings for an Epson-type dot matrix printer. Calling D prompts for input concerning print formatting, enabling a variety of paper sizes and printer types to be used.

Utility E automatically prints most of the relevant statistical information relating to a file. F does as it says, also printing the field titles.

G is used before and in conjunction with H and I. It dictates the layout and contents of address labels, forms, letters and the like. The menu is:

- 1 Save form
- 2 Load form
- 3 New form
- 4 Edit form
- 5 List format
- 6 Print format

Selecting 3 provides yet another range of function keys to enable formatting, printer configuration and so on.

Utility H uses the predefined print format and allows you to arrange it in such a way as to suit a variety of labels—eg, which fields are to be printed and in what order.

I is similar to H, allowing formatting of invoices and forms.

The disc contains 21 further utilities which may be used at will and incorporated into your own programs. They provide useful functions relating to the manipulation of data and files, extracting and inputting data and statistical information and many more. Useful examples are included.

Because the system is menu driven and makes extensive use of the function keys it is flexible and easy to use. StarBase is adequately protected with suitable error messages. It is an exceptionally good package, and I believe it would compare favourably with similar products.

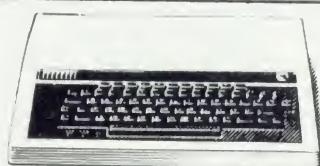


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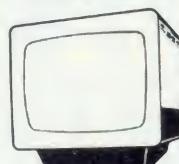


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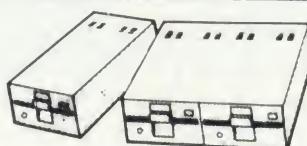
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# PRIVATE VIEW

Geoff Nairn turns the pages  
of the Edfax teletext emulator

108

'Edfax', Tecmedia, BBC model B with disk drive, £30 (£20 to schools)

**T**HE WORD teletext conjures up images of desperately looking under the sofa for the handset, or ploughing through interminable menu pages just to find out what's on television that evening. Add to this the delay between pages and the limited nature of the information stored on them, and the broadcast teletext services come out as very much the poor relation to public viewdata services such as Prestel. However, Prestel is expensive to use, and many organisations are now setting up their own private viewdata systems.

*Edfax* is a software package that lets you set up just such a system on a single BBC micro, with the pages of information stored on disc. Strictly speaking, it's a teletext emulator rather than a viewdata system; the difference is in the method of going from one page to another – more about this later. The name 'teletext', however, is reserved for broadcast services such as Oracle or Ceefax, so to avoid confusion *Edfax* will here be described as a private viewdata system.

The package was developed by Tecmedia in conjunction with the Microelectronics Education Programme primarily for the schools market, though it is available to others – albeit at a higher price. This means that the software has been tested at several schools before publication and that the manual accompanying the software covers educational objectives and possible applications, as well as being an easy-to-follow operating guide.

The software consists of two separate programs: the editor, which can create or edit pages of viewdata; and the display program, which, as its name suggests, is used to display the pages. The display program can be legally copied onto as many discs as you want, along with any pages.

Also on the disc is a database of 80 pages that demonstrates some of the

possibilities of the system. This is divided into three main sections, the first showing the use of the various viewdata 'attributes' – coloured text, double-height characters, etc – to create eye-catching pages. The second section demonstrates two possible applications of a viewdata system: a small database of possible career choices for children, and an 'electronic' school magazine. The third section is possibly the most interesting, containing 15 picture pages, all designed by schoolchildren and of a standard comparable to that of commercial 'information providers'.

The display program is simplicity itself to use: pressing SHIFT and BREAK automatically runs the program and displays page 100. In most teletext systems page 100 is reserved for the main menu, from which you select further sub-menus until you reach the desired page. The page numbers are keyed in as three-digit numbers that appear in the top left-hand corner of the screen, and after a couple of seconds the requested page appears on the screen. If the page number does not exist a message to that effect flashes up

and the program does not attempt to find the page on disc. A directory of valid pages must be held in memory.

Unlike proper viewdata systems, *Edfax* does not support page routing; to go from page 200 to page 201, for example, you have to key in the full page number '201'. With a viewdata system you might need to press only '1'. As some of the pages on Prestel can have up to 10-digit page numbers, page routing can save a lot of typing, but with only 80 pages on the *Edfax* system, the simpler teletext method of page access is quite adequate.

One of the best features of the display program is the 'cycle' facility, by which pages can be automatically displayed one after the other, in a similar fashion to a carousel slide projector. The delay between each page on the 'carousel' is preset at about 10 seconds, and to break the cycle you press the space-bar. This feature could be used for shop window displays, electronic noticeboards and other displays.

The 80 demonstration pages and the display program are good for familiarising yourself with how a viewdata



system operates, but the main aim of *Edfax* is to enable you to create your own pages and display them. The success or otherwise of any private viewdata system depends on how easily this can be done—that is, how easy the editor is to use.

The editor is a machine-code program and is copy protected. In a classroom, therefore, the program would have to be loaded into each computer in turn from the master disc—no backups can be made. On running the program you are asked to insert a data disc into the drive. This is the disc on which you want to save your pages, and a blank, formatted disc will be prepared to accept up to 80 pages (or 180 with an 80-track drive). As the Acorn DFS cannot support 80 different files, the editor at this point creates a single large datafile called PAGES, which is initially empty.

Next, a menu appears and you can



print a message on the top line of the screen when the cursor is over one of these invisible attribute characters. Two final points: attributes apply only to text entered on the same line and only for text to the right of them.

Pages composed only of text are all right, but by adding graphics they can be made more interesting. Viewdata graphics are produced by first selecting a graphics colour—the 'shifted' function keys—and pressing any of the lower-case or numeric keys. Each key produces a graphics character based on a 3x2 pixel grid, but to find out what key gives which graphics character involves continually referring to the back of the *Edfax* manual. This can become very wearisome, especially if a lot of graphics are required.

As an alternative, it is possible to construct a graphics character from the individual pixels by selecting the 'Define Pixel' mode. If you look at a keyboard, the keys e, r, d, f, c and v form a 3x2 rectangle, and these are used to turn on or off the six pixels making up the graphics character. This method is useful if you are not sure which graphics character would best suit a particular part of a picture, but it would be too laborious to make up all the graphics characters in this way.

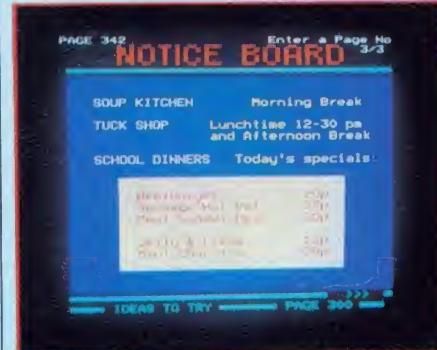
The *Edfax* editor could do with some



extra features: there is no method of inserting characters, for example—very frustrating if you have just done a page heading and then find it's not quite centred. Similarly, there are no facilities for moving or copying blocks of characters, or for inserting or deleting lines. These omissions are a result of *Edfax*'s having been designed primarily for schools, where ease of use

counts for more than sophistication, and Tecmedia is apparently working on a Mark 2 version with more advanced editing facilities, as well as a suitable screen dump routine for printers.

Having created your page you can save it on disc, either with the same



number as that used to load it—and thereby deleting the old page—or with a different page number. You are also asked for a 'cycle page number'—the number of the page you want to follow yours in the 'carousel'. If you don't want the page to cycle you supply the number '000'.

The possible applications for *Edfax* are limited only by the imagination of the user. In schools, a group of children could produce an 'electronic newspaper', or a specialised database could be created for a history project; a high street shop could install a BBC in its front window and advertise the week's special offers.

To summarise, *Edfax* serves as a



relatively cheap and simple introduction to the world of viewdata systems. The display program and sample database of pages nicely demonstrate the concept without the expense of teletext adaptors or modems. The editor is not particularly sophisticated, and the graphics are tedious to use, though this is a problem inherent in any viewdata editing system.

Previously, the software to set up a private viewdata system has cost several hundred pounds and required dedicated terminals. *Edfax*, at just £30 and running on a BBC micro, changes all that and will further encourage the growth of viewdata systems.

# MUG SHOTS.. for £174 plus VAT.



Now available to the micro-user, here is an interface to permit unlimited manipulation of digitised images from a video camera. Imaginative operators will be quick to realise the potential of the unit and space permits us to list only a few applications, viz: Computer aided graphics and design—image analysis for the physical sciences and education—robot vision—security—automatic map and photograph analysis—visual perception experiments, etc.

Taking a typical application, an ordinary video camera (black/white or colour) is focused on the subject. A single keystroke command causes the Video Camera Interface to digitise the image and display it on the micro-computer's monitor. Extensive menu-driven software options allow changes of colour palette, the ability to store (and retrieve) images from disc and screen dumps to EPSON printers.

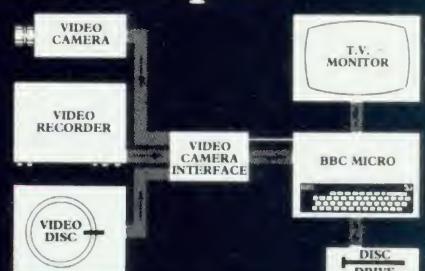
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# TEACHING INFORMATION THE SOFT WAY

Packages are becoming available that can turn the classroom into a microcosm of the wider world of information exchange. Jean Beck sorts them out

**I**N THE world at large, information handling, communications and storage have become immensely sophisticated involving automation and advanced electronic engineering. Moreover, the new approach to information is widespread, affecting many corners of our everyday lives. Communications advances now make it possible to patronise famous Oxford Street stores without leaving your home. Goods can be ordered 'electronically', entering the appropriate credit card number and awaiting delivery of the goods. With the right program and a modem link through the telephone system, this is possible with most home computers.

Customers in banks use information technology to withdraw cash and order statements and cheque books. The travel agent avails himself of it to check hotel reservations, book flights and transfer payments. The Nottingham Building Society has won new customers by offering investors who maintain a minimum sum in their accounts with the necessary technology in their homes to conduct all their transactions electronically.

But information technology has potential outside directly commercial transactions, too. The public library, for example, is now equipped to provide a variety of information sources. As well as traditional reference such as encyclopedias, trade directories, indexes, a terminal may be available to access an on-line database, such as Prestel, which is being constantly updated.

Despite the infusion of communications technology within society, information handling and communication in schools is still largely limited to reading, writing and talking, while information storage is confined to hand-

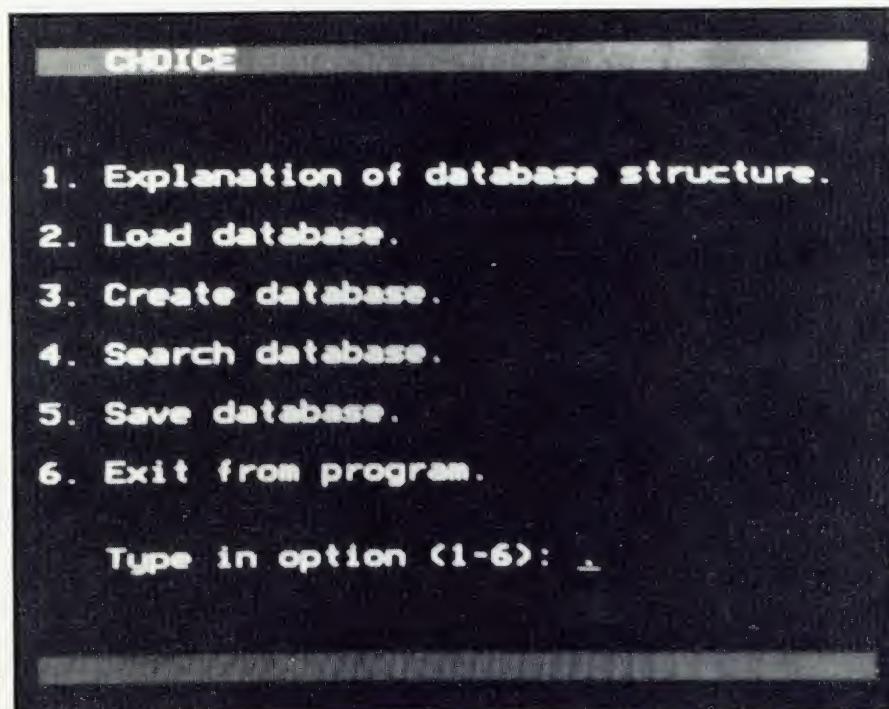
written notes and printed books. Information and communication have always been a substantial part of teaching and learning, with implications right across the curriculum.

The technological revolution cannot therefore be ignored by educationalists. A recent survey estimated that more than one in ten homes in the UK now have a microcomputer, and this figure is growing.

But integrating the new technology into schools presents problems, not least because of the speed with which it has arrived. Older teachers are often unwilling to come to grips with the

unfamiliar technology of what the Department of Industry defines as 'The acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a microelectronics based combination of computing and telecommunications'. And even teachers graduating in the 1980s may know nothing about this technology.

All this points to the need for a broad training programme, producing not only teachers in the specialist subjects of information technology and computer studies but bringing all teachers up to date with the relevance of infor-



Sample from an initial database menu

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Or is it just a littel bit off kei?

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SPELLWISE diligently checks every word in your text against the SPELLWISE data file. When it has finished you will be left with a list of words which are incorrectly spelt or typed, or are not in the base vocabulary of more than 6000 words (3000 in the tape version). Software is included to enable you to create your own data files. The tape version requires a recorder with motor control.

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mation technology to what they are teaching.

Pupils have always needed to be able to handle information and to communicate, and a good secondary education lays the foundation for independent information handling and retrieval by showing them how to use written reference sources. Even at this comparatively straightforward level, however, many pupils use these unselectively or inappropriately when completing project work.

Students now need to be aware of the new technology, its potential and limitations, and they need to develop the right kind of skills to survive in a society whose transactions are conducted through information technology. There are vast resources of information from outside sources to which the microcomputer in the classroom, serving as a terminal, can have direct access – and many schools have set up their own databases. The development of information technology skills therefore becomes a matter of urgency.

These skills need to be reinforced and developed across the curriculum and throughout the child's school life, and this can happen only as a result of a coherent education policy. Careful thought must be given about how micros can contribute to both the traditional and the new aims of education. The following aspects of information technology should be highlighted:

- **Accessing** information – Sources can only be accessed if one knows it exists, has an idea of the sort of information available and knows the searching strategy required for that source.

- **Evaluating** information – Children must be given criteria by which they can evaluate information. There is a great tendency to accept as gospel information on the screen, and pupils need to be aware that what is read on a screen has been put there by an information provider.

- **Manipulating** information – Technology allows us to manipulate facts in a way that has never been possible before. Pupils need to be shown the potential in this area.

- **Distributing** information – Electronic methods of communications such as electronic mail are changing the ways in which information is distributed.

Thanks to the Department of Trade and Industry's scheme to put a micro in every secondary and primary school – an ambition now virtually achieved – there is enough technology in schools to get started, plus the programs that allow us to introduce schoolchildren to the concepts of information storage, retrieval and manipulation. The BBC

micro is particularly well-equipped in this respect, with software that satisfies the aims of using microcomputers in education as enumerated by Daniel Chandler in the teacher's handbook for *Factfile*, a suite of programs provided as part of the Microelectronics Education Programme. Chandler's priorities were:

- To introduce the computer as a versatile, subject-independent learning aid.
- To provide a teaching tool that will be of use in stimulating discussion,

## SOFTWARE SOURCES

**The MEP Microprimer pack** is available from Tecmedia, 5 Grandby Street, Loughborough LE11 3DU (tel: 0509 230248) at £107.49 (£49.93 for schools) until July 1, when the price rises to £118.28 (£55).

**Factfile** pack from the Cambridge Micro Software division of Cambridge University Press (tel: Cambridge 64122). Price: £15 plus VAT. This was reviewed in the March issue.

**Quest**, an information handling package, is obtainable from the Advisory Unit for Computer Based Education, Endymion Road, Hatfield (tel: Hatfield 65443). The tape version costs £15 and the disc £17 (including p&p).

**Dataprobe** A double pack under preparation at Addison Wesley, Finchampstead Road, Wokingham, Berkshire RG11 2NZ (tel: 0734 794000) aimed at the 10-12 age group. Price yet to be decided. Probably available in late autumn.

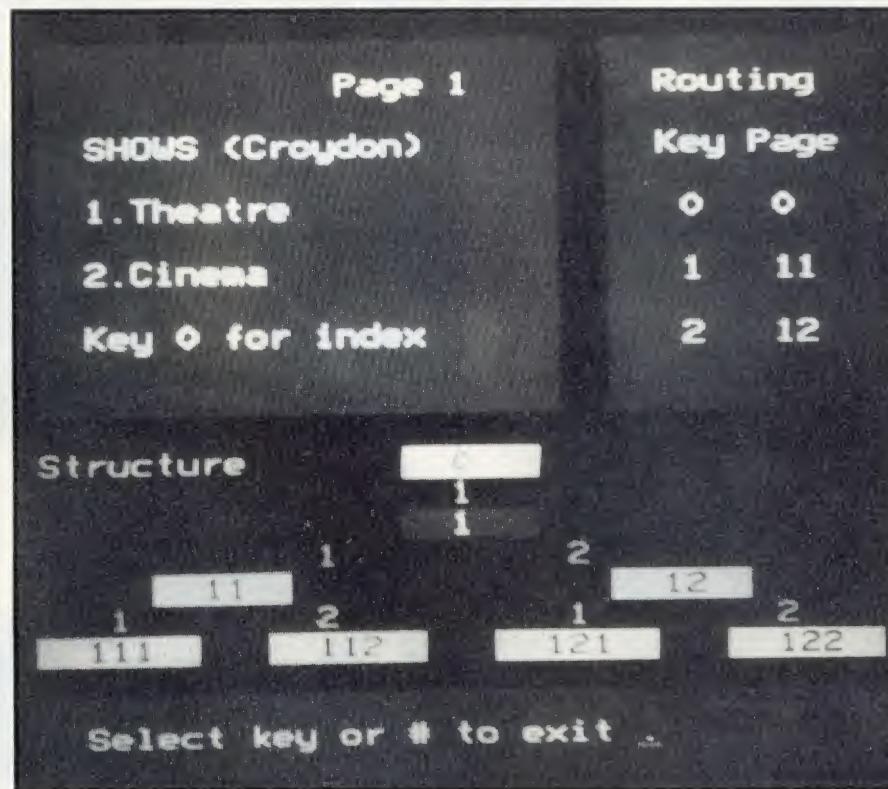
**Edword** (16k ROM) from Clwyd Technics, Unit 4, Antelope Industrial Estate, Rhydymwyn, Clwyd CH7 5JH. The Teacher Pack costs £18.95 (£21.95 disc); User Pack £38.95 and Starter Pack £56.95 (£59.95) – all excluding VAT.

**Wordwise** (8k ROM) from Computer Concepts, 16 Wayside, Chipperfield, Herts WD4 9JJ (tel: 09277 69727). Price: £46 (incl VAT and p&p).

**Prestel emulator** from the Independent Schools Microelectronic Programme (ISMEC), Westminster College, Oxford OX2 9AT (tel: Oxford 725904). Price: £19.95 for disc and manual.

**The Nottingdale ITEC local viewdata package** is being prepared by the ITEC Consultancy and will be available through Acornsoft in September.

**Edfax** is available from Tecmedia at £34.68 (see review on page 108 of this issue).

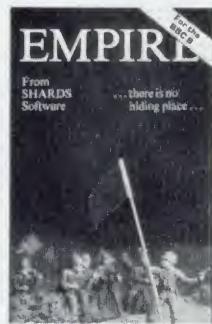
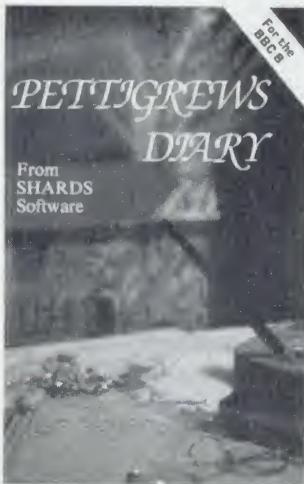


Tree structure of a database showing diagrammatic routing

113

# For little Acorns Mighty SHARDS Grow

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##### Educational

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encouraging creative writing and in preparing project work.

- To encourage the skills of ordered thinking and organising information.
- To enable children to assess the results produced by a computer and to be aware of the limitations of these techniques.

The following programs provide information handling and communication on the BBC micro:

- Factfile, Quest or Dataprobe to store and manipulate information.
- Edword or Wordwise to enable word processing.
- The ISMEC or Nottingdale ITEC packages, which allow the BBC micro to be linked to another computer and serve as a terminal for electronic mail or to access vast databases stored on remote mainframe computers, or to link schools in an area together on a local viewdata system.
- Edfax to simulate a teletext system.

In conjunction with the DoE, the Micro-electronic Education Programme sponsored a two-year project in Croydon to develop an IT curriculum for the 9-14 age range. The Croydon project aims to ensure that the educational needs spelled out by Daniel Chandler are met by producing pupil material, including software, for years 1 to 3 of the secondary

word processing allows anyone to produce almost perfect work. Less able pupils can build up a folder of neatly printed, corrected, work much more quickly than previously.

The booklet on information skills has a value beyond the scope of an IT course and can be used in any situation where project work is being used.

The series also deals with databases as applied in many situations in school, for example in history with census

### 'Information may be retrieved very quickly to answer a question'

materials; in science with databases on energy, pollution, periodic tables; in careers information; fiction and literature databases in English; and weather statistics in geography. They also, of course, serve as information providers in general through electronic school magazines. The *Serial* program demonstrates a simple database which stores data in simple tabular form. It

#### POINTS TO REMEMBER

1. Information skills are as much basic skills as literacy and numeracy.
2. Schools cannot opt out of the information technology revolution – it is here to stay.
3. Schools should plan ambitious courses even though their current equipment is inadequate.
4. Information technology teaching should use the technology to produce confident and competent flexible thinkers and independent learners.
5. Pupils must develop a critical awareness of the value of information provided by various sources.
6. There is no need to invent uses for information technology when so many are seen in everyday life.
7. IT opens new possibilities for pupils of all abilities, and teachers must not be frightened to allow the pupils to develop independently.
8. Teachers can find learning with their pupils, rather than always teaching them, a rewarding experience.
9. The full benefits of an IT curriculum will be obtained only in a school which has a comprehensive and coherent policy.

### 'Teachers prepared to learn with children find it rewarding'

school. The first fruits of the project, six booklets with accompanying software and teacher's guide, are being published in September by Addison Wesley, followed by a second set in April 1985.

The first booklets deal with information handling, information skills, and information retrieval. The materials and the programs have been designed to introduce pupils to the basic concepts, develop an awareness of the potential and limitations of technology, and develop the skills to exploit more fully the programs mentioned above. The entire course can be followed, or specific sections considered relevant at the time may be selected.

Two of these booklets provide a framework within which each pupil can develop into an independent and flexible information handler. Experience shows that the technology can unlock previously unseen potential in some slower learning students. For example,

allows serial access to a small number of records which can all be displayed on the screen simultaneously: *Link* demonstrates how pointers can speed searching the file; and *Invert* shows the use of inverted files as used in keyword databases.

With *Invert*, all the database can be seen on the screen but this still allows sufficient data to show how the price paid for inverting the file is offset by the immense increase in speed of access. It is hoped that pupils will move from this simple demonstration to using the British Library SIR program when it becomes available on the BBC.

Pupils should gain experience of viewdata systems, whether through local networks or British Telecom. The *Tree* program starts with a simple tutorial on hierarchical data structures, with the VDU used as an overhead projector. The main part of the program then allows the user to create a simple Prestel-type database including all routing between the pages.

Information technology gives the teacher another tool in helping pupils to manipulate information in a way that was not possible before. For example, information may be retrieved very quickly to answer a particular question and then displayed visually using programs which create maps or scattergrams.

Some teachers will feel that they have not had enough training or time to come to terms with the technology themselves, and so may be hesitant

### 'Pupils should gain experience of viewdata systems'

about using it with a class of pupils. However, the basic concepts of information and communication remain the same. Experience has shown that teachers who are prepared to learn with the children find it a very rewarding experience.

Teachers have a professional responsibility to ensure that they educate children for today's world. These materials aim to provide a basis from which to start, introducing pupils to the concepts of IT, rather than to specific equipment and programs, to help them make IT work for them.

*Jean Beck is the Communications and Information Studies Co-ordinator for Capital Region of MEP and is based at Kingston Polytechnic. Paul McGee is consultant to this series.*

## DOT MATRIX PRINTERS



ALL PRINTERS HAVE CENTRONIC PARALLEL INTERFACE UNLESS OTHERWISE STATED. ALL PRINTERS HAVE HI-RES. DOT ADDRESSABLE GRAPHIC MODE. PLEASE SEND SAE FOR FULL DETAILS.

### EPSON

FX 80 160 CPS. 10" wide fric. & pin feed	£344 + VAT £395
FX 100 160 CPS. 15" wide fric. & tract feed	£431 + VAT £495
FX 100 160 CPS. 10" wide fric. & tract feed	£261 + VAT £299
FX80T 100 CPS. 10" wide tract feed	£234 + VAT £269

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GP 100 120 CPS. 10" wide fric. & tract feed	£200 + VAT £229
Gemini 15x 120 CPS. 15" wide fric. & tract	£295 + VAT £339
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Radiax 10 200 CPS. NLO. 16K Buffer Par & serial interface, downloadable characters increasing value at	£431 + VAT £495
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GP100AS Serial interface ideal for Spectrum with microdrive	£174 + VAT £199

### SHINWA

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Spare ribbon cartridge for CP80	£6 + VAT £6

### RITEMAN

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### CANON

PW1080A 160 CPS. 10" wide 27 CPS NLO	£283 + VAT £325
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### COLOUR PRINTERS

Sekosha GP700A 7 colour 50 CPS printer	£347 + VAT £399
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ALL OUR PRINTERS HAVE 1 YEAR WARRANTY

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20 CPS Bi-Directional Logic seeking 10 12 15 CP1 + PS	£349 + VAT £395
Space 9K buffer less setting Daisywheel	£217 + VAT £249
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### BROTHER HR-15

13 CPS Bi-directional 10 12 15 CP1 + PS	£344 + VAT £395
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## PROFESSIONAL MONITORS



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\*FIDELITY  
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DM8112 12" Green screen 18 MHZ Hi-Res  
DM2112 12" Green screen 15 MHZ Monitor  
CD3175 14" RGB Normal Res Colour Monitor  
CD3175 14" RGB Medium Res Colour Monitor  
CD3115 14" RGB High Res Colour Monitor

**MICROVITEC CUB**  
1431 MS 14" RGB Normal Res Colour Monitor  
1451 MS 14" RGB Medium Res Colour Monitor  
1441 MS 14" RGB High Res Colour Monitor

**FIDELITY** Colour Monitor  
CM1414 RGB RGBY Composite sound col

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Phoenix High Res 12" Green Monitor  
Phoenix High Res 12" Amber Monitor

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## BBC MICROCOMPUTER SYSTEM

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Disk interface (free fitting)  
Mod A to Mod B upgrade kit

Fitting charge for A to B upgrade kit  
16K memory upgrade kit  
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Speech interface (free fitting)  
BBC disk manual - formating disk

Parallel printer cable  
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BBC Fourth language cassette

BBC Basic language cassette

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WE STOCK A LARGE RANGE OF SOFTWARE FOR BBC MICRO INCLUDING CP/M, MS-DOS & BBC SOFTWARE LONGMANS SOFTWARE PLEASE SEND LARGE STAMPED ENVELOPE FOR FULL DETAILS

## TORCH Z80 2nd PROCESSOR For only £347 + VAT

Torch 2nd Processor Z80 is supplied with perfect writer (a powerful Word Processor), perfect speller (spelling checking program - I should have used one for myself this advert!), Perfect Filer (A Database Program), Perfect Galle (Spreadsheet), it includes 64K memory (Almost 60K available to user) Fis inside BBC Computer!

Z80 2nd Process + Perfect Software  
Z80 Processor + Perfect Software + Dual 800K Disk Drives  
£347 + VAT £399  
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## GUARANTEED LOWEST PRICES

### 100% BBC COMPATIBLE MITSUBISHI AND TEAC SLIMLINE DISK DRIVES



These drives are supplied ready cased with all the necessary cables, formating program and User Guide

The following table gives the prices of the drives included on formating disc e.g.

D. DISASSEMBLER This is 6502 machine code disassembler

D. DUP To copy and rename a file on disc

D. FORMAT Formating program for 40 & 80 tracks

D. MDUMP Memory dump provides a disk usage analysis

D. MO\_DUMP Enhance your memory dump to include part of BBC memory

D. MERGE Merge a number of text files into one file

D. RELOCATE Downloads a basic program to & E00

D. SCREEN Screen dump for EPSON in all graphic modes

D. VERIFY Verifies every sector on a disk

D. MENU A flexible menu program

Single drive 100K 40 trks single sided  
Dual drive 200K 40 trks single sided

Single drive 100K 40 trks double sided

Dual drive 400K 40 trks double sided

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Single drive 400K 80 trks switchable DS

Dual drive 800K 80 trks switchable DS

Single drive 800K 80 trks, switchable DS

£147 + VAT £169  
£286 + VAT £329  
£173 + VAT £199  
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£199 + VAT £229  
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All above drives are low power slimline (0.3 A typ. at 12v and 0.4 A at +5v per drive). Normally extra power supply is not required. (The BBC Computer power supply is designed to drive two low power drive (IT IS NOT DESIGNED TO DRIVE TWO HIGH POWER DRIVES).

D. TRACK SS/DD DISKETTES (10 Box)

40 Track SS/DD diskettes (10 Box)

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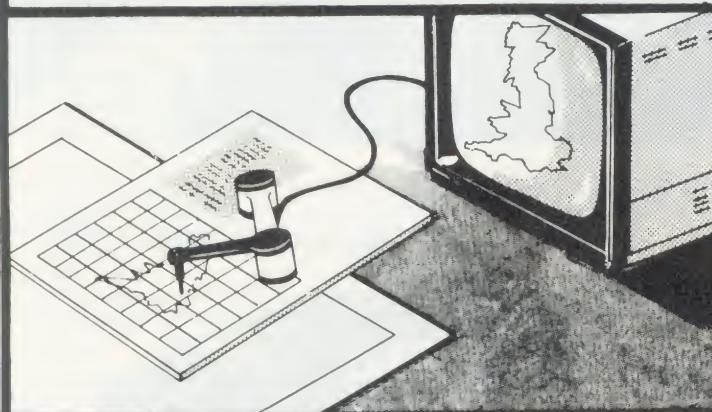
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# AT LAST. THE VITAL LINK BETWEEN PHYSIOLOGICAL DATA AND YOUR BBC MICRO.

The Harvard Universal Data Interface is a transient store that links the BBC Micro to an oscilloscope, a chart recorder, a dot matrix printer, a biological pre-amplifier, a human subject, a biological preparation, a stimulator, an X-Y plotter, a TV monitor and a disc drive.

The Universal Data Interface:

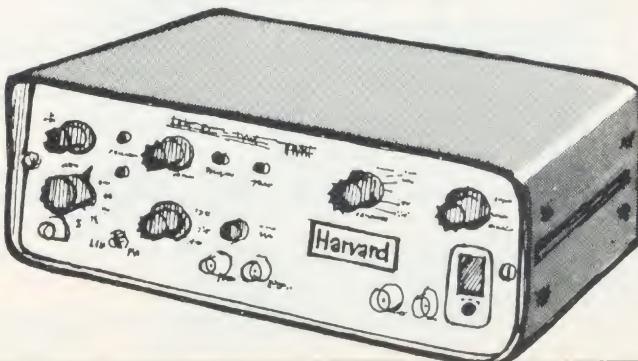
- Accepts analogue data in the frequency range DC to 6KHz.
- Typical applications include ECG, EMG, EEG, Evoked Response Extra-cellular and Intra-cellular recordings.
- Has available a complete range of software.
- Costs just £450. (exc. VAT P&P extra).

For full details contact Harvard Apparatus at the address below.

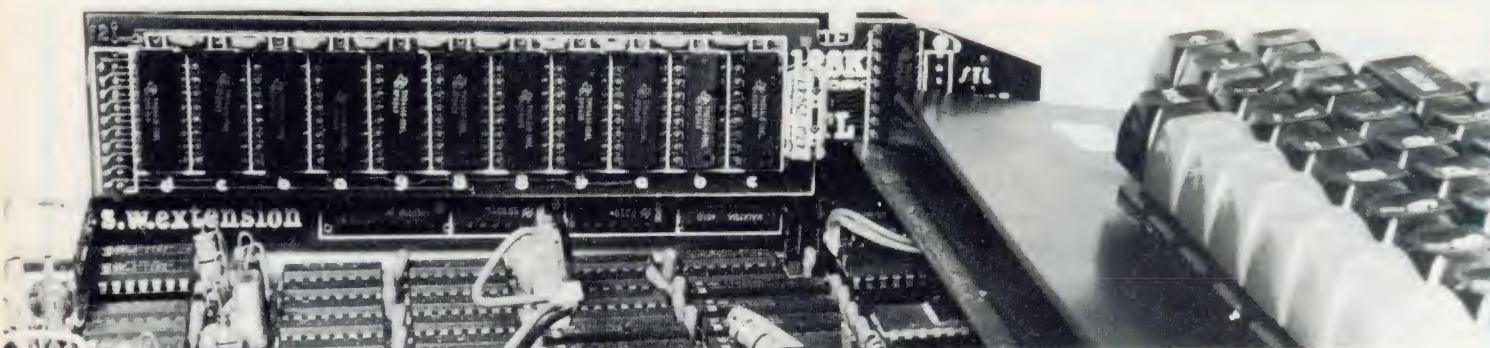
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Tel: (0732) 864001. Telex: 95293.



# SOLIDISK SIDEWAYS RAM: 8,000 UNITS SOLD



"Exciting" (ACORN USER JAN 84), "Power to your Beeb" (PCN 61, MAY 84)

## HOW ABOUT COMPATIBILITY?

The Sideways RAM is completely compatible with all issues of BBC computers, disks, all sideways ROMs, second processor, Torch disk pack, Teletext, Econet etc. but NOT with ROM extension boards, since it can replace them.

Its power consumption is so low that you can use it in conjunction with twin disks.

## HOW DOES IT WORK?

Occupying the same place as sideways ROMs (such as BASIC, DFS, CPN etc), it is treated like other Sideways ROMs and therefore can replace them.

The Machine Operating System uses Sideways RAMs as naturally as Basic, without procedures or programming rules.

Sideways RAM can run any language, any filing system including Hi-Basic and second processor DFS.

## SIDEWAYS RAM POWER IS IN THE SOFTWARE:

Different from Sideways ROMs, Sideways RAM can be written into. This property gives birth to a NEW GENERATION of software for the BBC computer: SERVICE RAMs and VIRTUAL MEMORY PROCESSOR.

Each SERVICE RAM has its own commands and code as its counterpart Sideways ROM but has its own private workspace and storage area thus leaving you with the lowest possible PAGE value (PAGE = &EOO). On the other hand, the Virtual Memory Processor can run huge MACRO BASIC programs (Megabytes are not the limit), keep them on disk and uses the basic 32k of RAM as transient program area. All software for the Sideways RAM system is free.

## FREE SOFTWARE?

Solidisk Sideways RAMs is bundled with lots and lots of software, FREE and we mean FREE, now and later. It is quite simple: for every Sideways RAM sold, £1 is spent on MORE software. Sideways RAM users are invited to spot new applications and contributions are rewarded at the usual rate of £1 for every 4 bytes of machine code.

The result is printed on the opposite page.

## HOW ABOUT THE FUTURE?

Solidisk Sideways RAM is also widely used in schools for ECONET stations, by professional programmers for writing programs, research laboratories for RAM disk data base, at home for wordprocessing and now even games.

New areas are being developed: Telesoft and Teletext logging, Speech Processor assembler and Relational Data base to cite a few.

As the price of 16k EPROMs are as high as £20 at the present time, more Sideways ROM software publishers will be willing to sell their software on disk. Solidisk will mail FREE OF ANY COST their advertisement to ALL Sideways RAM users providing the price of the Disk version reflects savings in the cost of the ROMs. Solidisk believes that the majority of BBC users will have their Sideways RAM fitted before the end of next year.

Also unlike other makes (SIR, APTL, WE Sideways ROM/RAM extension boards and the Aries B20), Solidisk Sideways RAM is expandable from 16k right to 128k and now to 208k. As a result of VLSI technology and volume of sales, Solidisk products also have a lower shop price than any other products.

## OTHER PRODUCTS FROM SOLIDISK:

### UVIPAC EPROM ERASER:

Uvipac is powered by the mains, simple to operate and can erase 3 Eproms of any type in just 15 minutes. Uvipac is ideal for home use.

### DETACHABLE KEYBOARD CASE:

Remove the keyboard from the BBC computer and instal it in the new case. Replace the old 3" keyboard tail by the new 24" cable and you can work really in comfort even for very long hours. The keyboard case is more a productivity tool than just ergonomics.

### CPU CASE:

Replace the top of the BBC computer case by this metal CPU case. Sit your monitor on top (it is tough enough to take even your weight!). The CPU case has 2 compartments for half height 5.25" disk drives with fixing screws, air vents and provision for a bolt-on fan. At first sight, there is no trailing wire. Looking inside, there is enough room to accomodate Teletext Adapter, Second Processor, Solidisk and a fan!

### DOUBLE DENSITY DISK INTERFACE:

2 versions of this double density interface will be available: as direct replacement for the Acorn Disk Interface (Version A) and as a Second Disk Interface (Version B) adding to your existing interface. They all use the same Western Digital controller chip (WD1770). Price £39.95 inclusive.

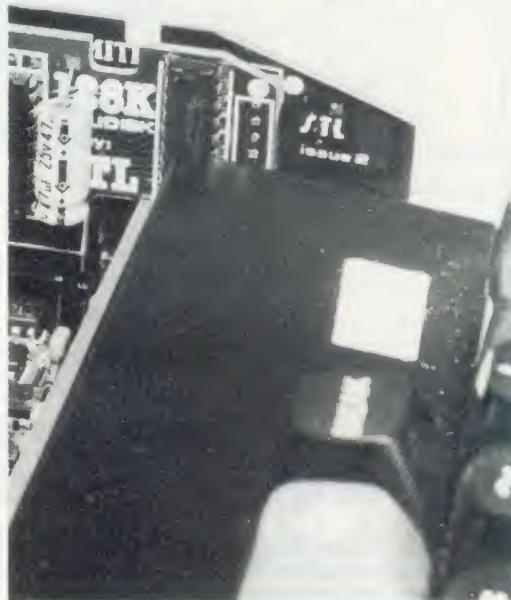
### DISK DRIVES:

3 models are being offered:

STL55A: 40 tracks single sided, STL55F: 2 x 80 tracks, double sided and the best of mini floppy technology STL320: 2 x 160 tracks, double sided.

All disk drives are supplied with cables, formatter disk, head cleaning kit and 2 year warranty.

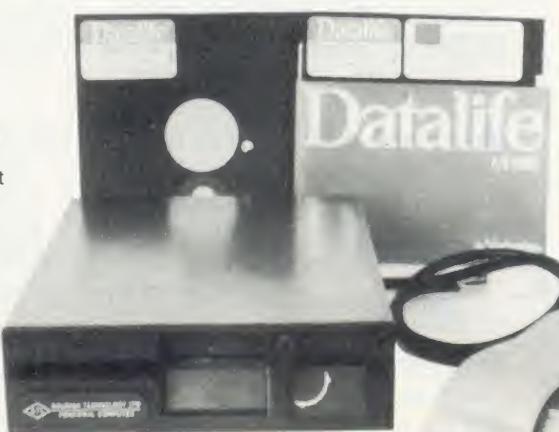
## "Break the Ram Barrier" (A&B)



UVIPAC EPROM ERASER



TEAC DISC DRIVES FD55 Series



# WHICH SIDEWAYS RAM DO YOU NEED?

HOW EASY TO INSTALL:

Solidisk Sideways RAM is available in 16 (SWR16), equivalent to 1 sideways ROM, 32k (SWR32), equivalent to 2 sideways ROMs, 128k (Solidisk), equivalent to 8 sideways ROMs and the 208 Solidisk equivalent to 12 sideways ROMs. You can buy a small Sideways RAM now and upgrade it later. From the SWR16 to the SWR32 is by straight exchange, from the SWR32 to the Solidisk is by adding the 96k Solidisk Extension, from 128k to 208 is by exchange of the RAM card.

## FREE SOLIDISK SOFTWARE:

### WORD64:

WORD 64 is a Service RAM, it uses Solidisk as storage for WORDWISE, up to 64K free characters for any text.

### SILEXICON:

SILEXICON is a Spelling Checker for Solidisk. SILEX scans texts at more than a 1,000 words a minute and compares each word against the dictionary, Silexicon marks the mis-spelt words for either addition to the dictionary or eventual correction.

### PRINTER BUFFER:

PRINTER BUFFER is a Service RAM, it increases 500 times the normal 32 bytes printer queue to 15K bytes, completely transparent to the user. PRINTER BUFFER is as useful for printing a long document as for a short program listing.

### STLEOO:

STLEOO is a Service RAM, it is Disk Filing System that leaves PAGE at &EOO, has built-in disk formatter/verifier and automatic track stepping for 40/80 track disk drives.

### STL150:

STL150 is a Service RAM to enhance Acorn's .90 DFS to offer up to 150 directory entries per side.

### STL-RFS:

STL-RFS (RAM/ROM filing system) is a Service RAM and an innovation in portable applications. STL RFS saves any program in a Sideways ROM format, it can then be copied onto EPROM to give instant recall of your programs. Plug this EPROM into any sideways socket, type \*RFS and it runs itself. Compatible with the ELECTRON and BBC, tape and disks, SWR16, SWR32 and Solidisk.

### INDEX:

INDEX is a Service RAM, it stores all the entry points of one or several sequential data files such as mailing list, stock list, accounts etc, merges, sorts them in alphabetical order and gives instant access to any record. INDEX can handle 1,100 records of any size, any type, any number of fields.

### MACRO-BASIC:

MACRO-BASIC is a program generator. You use a wordprocessor to create a command file which is then scanned by MACRO. MACRO uses other programs, subroutine libraries, text files (actually any or all files on your disks) as source to generate a bug free BASIC program which can be very large (Megabytes are not the limit).

### VIRTUAL MEMORY PROCESSOR:

VIRTUAL MEMORY PROCESSOR (VMP) uses extensively overlay technique and Solidisk as back store for very large programs that cannot be run otherwise. VMP uses the 32k basic RAM as transient area: it operates on a Main Program as generated by MACRO-BASIC, taking different segments from the Solidisk Store, POOL, HOLD, FREE or CLEAR segments from the transient area. For example: VMP will accept 20 segments of 10k of Basic assembler and assembles it into 16k of machine code.

### MENU:

MENU puts all computer's resources at your fingertips. MENU displays your Sideways Firmware, Disk Directories, Sideways RAM system, Solidisk System etc.

### MORE FREE SIDEWAYS RAM SOFTWARE TO COME:

While others are making promises for software to be written, Solidisk Systems RAM comes with a complete, novel and powerful software package including compatibility with existing sideways software.

Each Sideways RAM is accompanied by the Sideways RAM User Manual, full 1 year warranty, 1 utility disc\* and free mailing on all new publications from the Software Support Service.

\*It should be understood that we cannot put as much free software on a 40 track single sided as on 80 tracks. The present software package require 160 tracks of storage and can be accommodated on ONE 2 X 80 track double sided diskette, only the most useful programs are supplied on other formats (ie 40 track single sided, 2 X 40 track double sided, 80 track single sided). Should you require the whole collection of free software, please place an order for extra disks.

For the technical minded: The Source Code and Technical Manual (3 floppies and a 300+ page book) price = £10. the

SILEXICON EXTENSION PACKAGE (3 floppies and a 40 page manual, 30,000 word dictionary: English and French now, German and Spanish planned) price = £9.00. '4S' also publishes regular updated SWR utility discs at £3.00.

Every user can do contract work for the SUPPORT SERVICE and make a lot of money for him/herself!

### HOW TO ORDER?

You can order any item using the coupon. Post and packing is only charged once.

Access and Barclay card holders can place their order by phone.

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Callers are requested to ring first for appointment.

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If ordering more than one item, deduct £1 per item as post and packing cost is only charged once.

SOLIDISK TECHNOLOGY LIMITED  
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SOUTHEND-ON-SEA  
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SOLIDISK'S NEW TELEPHONE NUMBER:  
SOUTHEND-ON-SEA (0702) 354674  
(10 lines with automatic exchange)



Push in the base unit



Connect the control wires

### PRICE LIST (including VAT and post & packing)

SIDEWAYS RAM:	
SWR 16K	£43.65
SWR 32K	£59.95
128K SOLIDISK	£150.95
208K SOLIDISK	£243.00

The following are upgrade prices for existing Sideways Ram owners:  
16 - 32 (please return complete item) £18.00  
16 - SOLIDISK (please return complete item) £109.00  
32 - SOLIDISK (no return necessary) £93.00  
128K - 208K SOLIDISK £93.00

### DISK DRIVES:

STL55A (40 track, single sided, cased with cables, diskette, manual and 2 years warranty)	£142.95
STL55F (2 X 80 track, double sided, as above)	£232.95

STL320 (2 X 160 tracks, double sided, as above) £499.00

FLOPPY DISKS (DATALIFE Verbatim):  
MD525 (SS/DD 40 or 80 track) box of 10 £16.00  
MD550 (DS/DD 40 or 80 track) box of 10 £22.00  
MD557 (DS/DD 98 TPI) box of 10 £27.00

CPU CASE DETACHABLE KEYBOARD CASE £13.00 £27.99

EPROM PROGRAMMER (used with Sideways Ram) £16.00

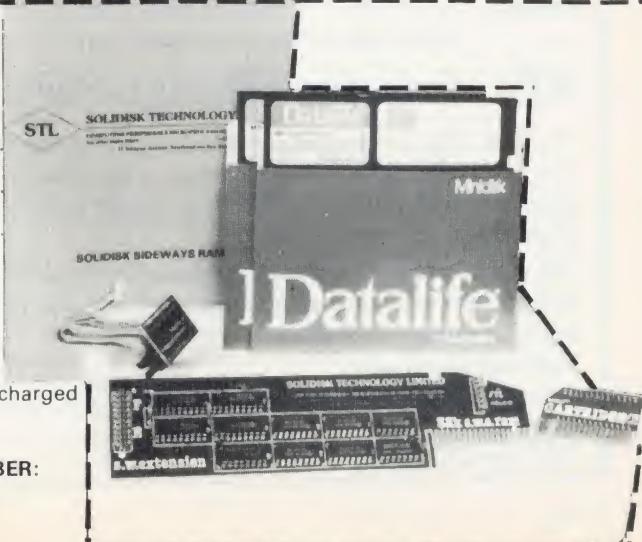
UVIPAC EPROM ERASER (free standing unit) £20.95

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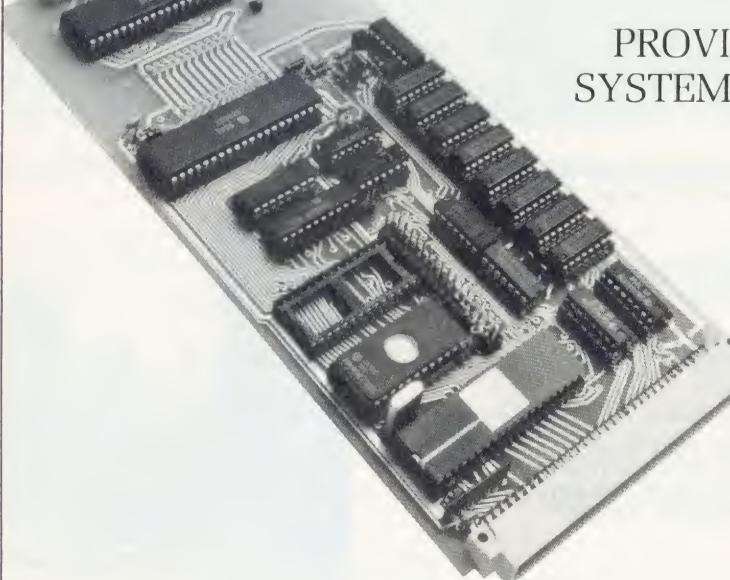
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# ACTION SEQUENCE FOR CONVERSION

Barry Pickles finalises his Basic translation kit

**I**N THE first two parts of this series we listed some of the keywords in BBC Basic, explaining how they can be converted for the Atom, and we discovered which VDU calls have an Atomic equivalent. Before we get down to actually translating a BBC Basic program into AtomBasic, however, let's consider \*FX calls and the problematic conversion of machine code from one micro to the other.

A full summary of \*FX calls was published in the November '82 issue of *Acorn User*. The ones that can be used are given in table 1. In conversion most calls can be ignored as, generally, they are not essential to the running of a program, even though they are performing sophisticated functions. \*FX calls are also used in the form A% = &XX: CALL OSBYTE, where XX is the number corresponding to the \*FX call.

*FX	Atom equivalent
6,x	?#FE=x
19	LI.#FE66
119	SHUT#
121	INKEY (see text)
132	Same as HIMEM
133	Always #8000 on Atom
134	A=?DF*256 + ?DE + ?#E0
135	?A (where A is as above)
150/151	Read/write SHEILA

Table 1. \*FX calls

Machine code is the most difficult of all to convert, since most machine-code routines nowadays use machine specific OS calls to save coding. The only way to deal with this is to ascertain what the code is doing (if you're lucky, from a program description) then write your own code, using Atom OS calls. You will find, in published programs at least, that the same calls are used repeatedly and with time you'll become used to them. You will also find that few non-BBC programs are in assembler format. Most POKE the op-codes and data directly into memory. If the code is for a 6502-based machine (Apple, Atari, Commodore 64, Oric, Pet, Vic) you can do this yourself, then disassemble it to see whether you can make sense of it.

You will further find that few BBC programs make direct calls to OS routines and ports; instead, they use indirection, either through block zero or OSBYTE (see above). OSBYTE corresponds to location &FFF4 and can address three blocks, known as FRED, JIM and SHEILA. FRED is page &FC, JIM is page &FD and SHEILA is page &FE. Calls to the FRED and JIM areas access the Beeb's 1MHz bus and, if the program does this, it is non-convertible.

Reading and writing to SHEILA allows access to various internal chips and conversion may be possible if you know what it's doing. One area of memory that can be easily converted is associated with the user port (VIA), mapped at &FE60-&FE6F, directly corresponding to £B800-£B80F on the Atom. Calls are made through the A and X registers. A%=&96 performs a read, while A%=&97 does a write. The X register is used as an offset from &FE00, thus:

```
LDA &96
LDX &60
JSR &FFF4
```

reads location &FE60, which is port B of the VIA.

Converting machine code is a matter of practising until you get proficient at it.

To convert a program successfully, it helps to follow a plan of action.

First, read through the program, using the outline description if there is one, and break it down into short action sequences, writing each one down and the line numbers where it occurs. This is like preparing a flow-chart in reverse. Mark the sequences that you think will convert without much problem and note any in which AtomBasic will allow you to program more efficiently.

Now make a list of every variable used, its type (integer, string or floating point) and what it is used for. Against each one, allocate a similar type of Atom variable. This is where you may need to do some lateral thinking. Since most Basics allow the use of long variable names and recognise at least the

```
0 REM Cubes
5 REM CC Acornsoft 1982
20 MODE 1
30 VDU5
40 VDU19,2,4,0
50 REPFAT
60 FORY=0 TO 1200 STEP 10
70 H< 1100 RND(Y)
80 PROCCUBE(RND(1300),50, H<, (1200 H>),6, RND(4),1)
90 NEXT
100 VDU19,RND(3),RND(7),0;
110 UNTIL FALSE
120 DEFPROCUBE(X>,Y>,S>,C>)
130 D>-S>+3: E>-S>+D>
140 VDU29,X>;Y>;
150 GCOL0,C>
160 MOVEO,O: MOVEO,S>:
PLOT85,D>,E>
170 MOVEO,O: PLOT85,E>,L>
180 MOVEO,O: PLOT85,E>,D>
190 MOVEO,O: PLOT85,S>,0
200 GCOL0,C>+3
210 DRAW S>,S>: DRAWO,S>:
DRAW O,O: DRAW S>,0
220 MOVEO,S>
230 DRAW D>,E>: DRAW E>,E>
240 DRAW E>,D>: DRAW S>,0
250 MOVB S>,S>: DRAW E>,E>
260 ENDPROC
```

Listing 1. 'Perspective' series of overlapping cubes drawn from top to bottom of screen by a BBC Basic program from 'Creative Graphics on the BBC Micro'

first two characters as significant, you will often find that more than Atom's 27 variables are needed. You can always use arrays and, for tables, byte and string indirection may be a better solution.

Next, look at the routines again and see if any are incompatible with the Atom (eg. SOUND effects) or not essential to the program. Delete these – you can always add something later, if memory allows.

Now you are ready to begin. Convert each routine separately and test the conversion before proceeding to the next one. Do the easy ones first. Successfully converting three-quarters of a program gives you the incentive to tackle the remainder, rather than getting bogged down at the beginning by attempting the difficult bits.

Listing 1 is a BBC Basic program, again taken from the Acornsoft book

page 126 ▶

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Barry Pickles this month pays good money for mode 4 text, a break key mod, a line deleter and a disc utility to recover lost data

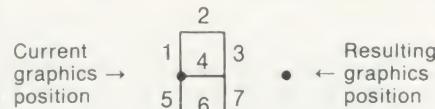
## £20 Text plotting in mode 4

HAVING said recently how complicated it was to write in text 4, along comes our old friend Jeff Carter (now living in Ponderosa territory) to prove me wrong. It's not exactly Helvetica—Acorn User's typeface—but it works, and earns Jeff £20. Over to you, pardner:

After reading the Atom Forum's article on Mode 4 text (November issue), I thought I'd send you the system I have used, which is much less memory-intensive than the methods presented, requires no assembly language and permits the size of the characters to be varied. Its drawbacks are that it's somewhat slow and the characters look rather strange (especially K, Q, V and X).

The routine is given in listing 1. It plots one character at the current graphics position and resets the graphics position to five pixels to the right of the character.

The L vector contains one byte for each digit and two bytes for each upper-case letter. The seven least-significant (rightmost) bits of each byte are used to control whether the segments of a seven-segment 'display' are on or off:



The zero (least-significant) bit controls segment 1, and the sixth bit controls segment 7. A one means the segment will be plotted; a zero, the segment will not be plotted. Digits are plotted as one seven-segment 'display', letters as two 'displays' with two common segments. Figure 1 shows the character set that I've defined.

The factor of five given in the plot statements is the length of one segment and produces fairly large characters. Digits are 6 x 11 pixels and letters are 11 x 11 pixels. This factor can be

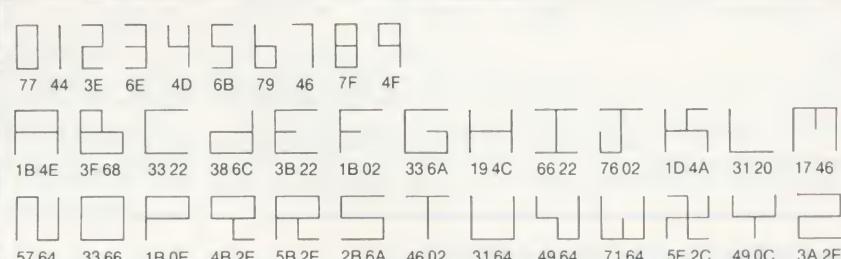


Figure 1. The character set

any value in the range 2 to 95. Any smaller and garbage will be plotted; any larger and the characters will be too tall for the display (and only partially plotted).

I got the idea of using the bits of a byte to control a seven-segment 'display' from a biorhythm program published in an Atom user group newsletter. I designed this character set and

wrote the routine to select the controlling byte(s) from a character's ASCII code.

The routine is not limited to mode 4. It will work in any graphics mode, including colour modes. The size and shape of the characters will differ from mode to mode if the plot statements are not altered.

Page 125 ►

```

5 REM MODE 4 CHARACTERS
10 DIM L(63), A(10)
20 L$ = "#6E3F4477; L14 = #4679684D
30 L18 = #4E184F7F; L112 = #2233683F
40 L116 = #22386C38; L120 = #6A330218
50 L124 = #22664C19; L128 = #4A100276
60 L132 = #46172031; L136 = #66336457
70 L140 = #2E480F1B; L144 = #6A2H2F58
80 L148 = #64310246; L152 = #64716449
90 L156 = #0C492C5E; L160 = #2E3A
99 REM DEMONSTRATION ROUTINE
100 SA = "ATUM"
110 CLEAR 4; MOVE 10, 95
120 FOR I = 0 TO LEN(A) - 1
130   C = A?I; GOSUB c
140 NEXT I
150 L$=INK #FFE3; PRINT $12
160 END
999 REM CHARACTER PLOTTING ROUTINE
1000c1IF C = 32; PLOT 0, 10, 10; RETURN
1010 IF C < 48; RETURN
1020 C = C - 48; IF C < 10; GOSUB e; PLOT 0, 5, 0; RETURN
1030 C = C - 17; IF C < 0 OR C > 25; RETURN
1040 C = 2 * C + 10; GOSUB d; PLOT 0, 5, 0; RETURN
1099 REM UPPERCASE LETTER PLOTTING ROUTINE
1100d = C; GOSUB e
1110 C = D + 17; GOSUB e; RETURN
1199 REM ONE SEVEN-SEGMENT "DISPLAY" PLOTTING ROUTINE
1200eC = L?C; PLOT (C&1), 0, 5
1210 C = C/2; PLOT (C&1), 5, 0
1220 C = C/2; PLOT (C&1), 0, -5
1230 C = C/2; PLOT (C&1), -5, 0
1240 C = C/2; PLOT (C&1), 0, -5
1250 C = C/2; PLOT (C&1), 5, 0
1260 C = C/2; PLOT (C&1), 0, 5
1270 RETURN

```

Listing 1. Mode 4 characters

Invented a routine or discovered a hardware modification for the Atom? Here's a chance to show your originality and win some cash. Send your idea to: Atom Forum, Acorn User, Redwood Publishing, 68 Long Acre, London WC2 9JH.

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£5

**Fast deletion****of program lines**

A FIVER goes to Colin Hollyman of Fareham, Hants, for his time-saving line-remover utility. He writes:

The Atomdel program in December's *Acorn User* certainly is a useful utility. It is usually faster to get the computer to delete unwanted lines and it is less likely to lead to errors. But how many programmers will take the time and trouble to find the right tape, find the place on the tape and load the program, just for the sake of deleting a few lines?

I have a simple routine which can be used to remove any number of lines, provided they are at the end of the program, and temporary lines - eg, aids to debugging or data for testing - can usually be written as a subroutine at the end of the main program.

Suppose all lines after 1000 (included) are to be deleted. Change line 1000 by entering

1000@ (RETURN)

The new line should contain no spaces and any character (other than a number) can be used.

Set a pointer to the start of the current text space

A = #2900

Then increment A until it finds the line

DO A = A + LENA + 3; UNTIL \$A = "@"

using the character entered in the first line to be deleted. Set the 'end of program' pointer

?(A-2) = 255

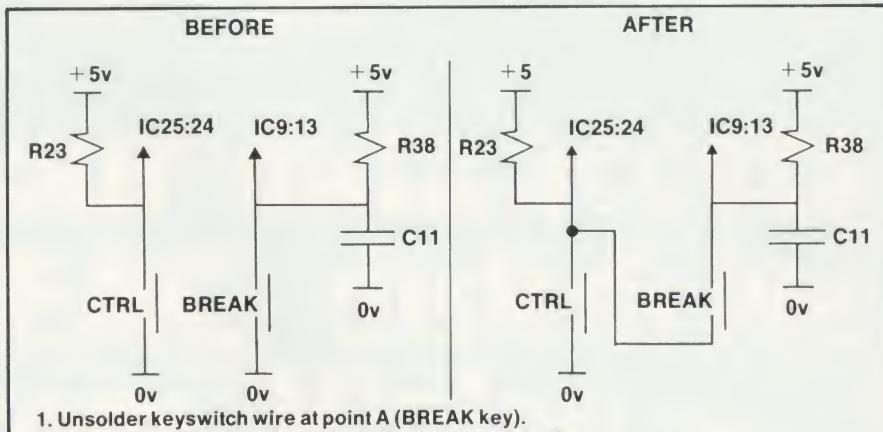
and then reset TOP by

END

On listing, all lines with a line number 1000 and greater will have been deleted.

All this, except the change to line 1000, can be abbreviated and entered directly as one line:

A = #2900; DO A = A + LENA + 3; U.\$A = "@"; ?(A-2) = 255; E.



1. Unsolder keyswitch wire at point A (BREAK key).
2. Solder length (10in) of insulated wire to keyswitch wire.
3. Slide insulating sleeve over joint and down hole A to isolate new wire from PCB track
4. Solder other end to point B (after removing solder resist lacquer).

Modification to make 'BREAK' operative only when used in conjunction with 'CTRL', by Alan Knowles

**£20 Utility to recover****lost data**

DAVID LAKE of Newbury hopes his disc utility will be as useful to readers as it has been to him. It earns him our £20 accolade. Let David explain:

I would be surprised if any owner of an Atom disc system can say that he has never lost a valuable program by accidentally corrupting a floppy. This may occur if a floppy is left in the drive on power-up, for example, or upon interruption of the power supply during a disc write operation. Another maddening cause of lost data is failure to type a space as a qualifier after the \*SET command. The short program in listing 2 is a disc utility designed to help recover that lost data.

The most usual cause of a corrupted floppy is an error in the first sector,

which is where the catalogue is stored. If the disc operating system is unable to read the catalogue, it doesn't know where the programs are situated on the floppy, so it gives up with one of those 'DISC ERROR XX' messages. The listing enables you to read any of the valid sectors on the floppy into memory, from where the programs can easily be reconstituted, especially if you use one of the commercial toolkit ROMs.

An alternative, which often proves easier, is to store your own dummy catalogue on to track 0, sector 0. This may allow the DOS to read the floppy in the normal way, and once it has been established what the real filenames are, the catalogue can be reformatted correctly and stored back on the floppy. This method naturally requires a detailed knowledge of the format of the catalogue, and this is given in table 1 overleaf.

For the adventurous, table 2 gives some of the more useful DOS routines

```

5P,$12
6DIMR10,Q10
7IN,"READ OR WRITE"$R
8IF$R="WRITE";GOTO 10
9$R="READ"
10P.''$R''
15IN,"TRACK"R;IFA>39 G.15
17?#80=A
20IN,"SECTOR"R;IF A>9 G.20
25?#81=A
30IN,"BLOCKS"R;IF A+?#81>10;G.30
32?#82=A
35?Q=?#84=#
40IN,"START PAGE"#$Q+6;IFLENQ>8;G.40
50?#83=255;EXEC$Q;?#84=?#84-1
110DIM LL5
112LL2=#8200
113P.#21
115FORX=0TO1
117P=#8200
120JSR #E79A
130BNE LL1
140JSR #E75B
150JSR LL2;]
160IF$R="WRITE";[L:LL0 JSR #E796;]
161IF$R="READ";[L:LL0 JSR #E792;]
162LDA #83;STA #F6
163LDA #84;STA #F7;]
170IF$R="READ";[LLDA @#53;]
172IF$R="WRITE";[LLDA @#48;]
180JSR #E7ED
190JSR #E7A4
200BNE LL0
210:LL1 RTS
220:LL2 LDA #80
230STA #EC
240LDA #81
250STA #ED
260LDA #82
270STA #F1
280JMP #E709
420J
430N.
435P.$6;P=#8200;LINKP
440END

```

Listing 2. David Lake's data recovery utility

#2000-#2007	First eight ASCII characters of title.
#2008-#20FF	Names and qualifiers of files. This area is split into 31 blocks of eight bytes, corresponding to each file. The first seven bytes give the filename, the eighth gives the ASCII qualifier. Bit 7 of the qualifier is set if the file is locked.
#2100-#2104	Last five ASCII characters of title.
#2105	Extent of table.
#2106	#2000 + ?#2105 is the start of the last filename in the catalogue.
#2107	#2100 + ?#2105 is the start of the data for the last file (see below).
#2108-#21FF	Unknown. Unknown. This area is again split into 31 blocks of eight bytes, each block corresponding to the filename in the same place in the table above. The format is: 1st 2 bytes, start address 2nd 2 bytes, execution address 3rd 2 bytes, length 4th 2 bytes, start sector.

Table 1. Catalogue format

which access the INTEL 8271 floppy disc controller. This device is memory-mapped to #0A00-#0A04, and data is transferred under non-maskable interrupt. The floppies are formatted into 40 tracks of 10 sectors, each containing 256 bytes. Listing 2 could be adapted for use in other programs, to make best use of the storage space on the floppy. In particular, the Forth system could be modified to access sectors individually, giving up to 200 screens per floppy, instead of the meagre 31 in the standard system.

#CD	*SET qualifier
#AC	*USE qualifier
#EE	Drive number & status flags
#EC	track number
#ED	sector number
#F1	#20 + number of sectors to read
#F0	number of attempts to read/write before giving up
#F6-#F7	address of start of data

Table 3. Page zero locations

## ► page 121

*Creative Graphics on the BBC Micro.* Breaking it down, line 20 sets up a hires screen, line 50 starts an outer loop (which is never jumped out of) and line 60 begins the main loop. Line 70 sets up H% to a constantly reducing value – the reason for this will become clear later. Line 80 calls the cube drawing routine, passing over values for X%, Y%, S% and C%. Line 90 terminates the main loop and line 100 effectively re-runs the program. The cube drawing routine follows, and line 130 calculates the position of the rear cube face, while line 140 sets the cursor origin to X%, Y%. Line 150 selects the drawing colour for the front face, which is then drawn by doing two filled triangles. Line 200 changes the colour palette again, before finishing off by drawing the rear face and the connecting lines.

This program draws a series of progressively larger cubes from the back (top) of the screen to the front (bottom). Hidden line removal is taken care of by 'pasting over' new cubes on top.

Now for the variables. H% constantly reduces in value, ensuring that later drawings start lower down the screen. S% uses H% in inverse proportion, to give a cube size (edge) which is constantly increasing. E% and D% use S%

to calculate the position of the rear cube face (so that all the cubes are drawn from the same viewpoint) and X% and Y% determine where the cube's screen position is. The remaining variable, C%, determines the colour of the cube face.

Listing 2 shows the resulting program after conversion to AtomBasic. This is of course in black-and-white, so line 40 of the original program has been ignored, and the REPEAT...UNTIL loop has been changed to a straight re-run. Variable signs have been preserved, with the exception of X%, which now becomes P.

Since plotting filled triangles involves a lot of coding, I have changed

#E000	Reset FDC and initialise its parameters.
#E016	Print the message following the subroutine call (terminated with a negative byte).
#E231	Load catalogue buffer (*DIR).
#E237	Load catalogue, decode and display.
#E3E5	New command line interpreter.
#E6FF	Load vectors and prepare to access first two sectors on disc (catalogue).
#E729	Read result register of FDC.
#E75B	Load head.
#E792	Boot block of code for read or write to #00F2-#00FC.
#E7A4	Act on result of operation.
#E7D2	Send command in acc to FDC.
#E7E4	Wait for end of operation.
#E809	Send parameter in acc to FDC.
#E84F	Read data bootstrap code.
#E85A	Write data bootstrap code.
#E87B	NMI service routine.
#EEE2	Setup vectors.

Table 2. DOS routines

the cube drawing routine (subroutine C) so that it draws a filled square. There is no colour, but lines 150 and 160 determine whether to draw in white or black, thus achieving the 'pasting over' effect. Apart from the addition of some variables for intermediate calculation, the only other change is the calculation in lines 50-70 for the parameters to pass over to the subroutine.

I hope that this short series has shown Atom users that they have a passport to the pages of *Acorn User* that lie outside the Atom section. I cannot go into every aspect of other Basics, but practice makes perfect, so try your hand at conversion and open up new horizons on your programming.

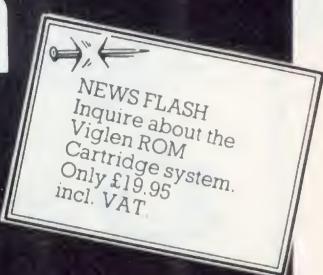
5REM: TRANSLATED BY	Cubes	120CD S '3;E-S-Z	250PLOT6,Z,CY,D
7REM: B PICKLES		130P,D+Z,G,E,D	260PLOT6,Z,CQ,D
10CLEAR4		140Q,Y,S	270MOVE E,CY,D
20F,Y-110192 S,4		150IFC=0 M-7;G,D	280PLOT6,E,CQ,D
30 O-Y		160M-5	290IFM=5 R,
50 H-190 A,R,<CY		170DE,P,Z TO G	300MOVE Z,CQ,D
50 Z A,R,>255;Y H		180MOVE P,Y	310PLOT6,E,CQ,D
60 S-C190-ID/4		190PLOT M,P,Q	320PLOT6,G,Q
70 C A,R,<2;GOS: e		200Y,Y,(P,F)	330PLOT6,G,Y
80 Y,O		210Q-Q,(P,E)	340PLOT6,E,Y
90N.		220N,	350PLOT6,Z,CY,D
100LT,4FFF3;RUN		230MOVE G,Y	360R,
		240PLOT6,E,CY,D	

Listing 2. The cubes program converted to AtomBasic

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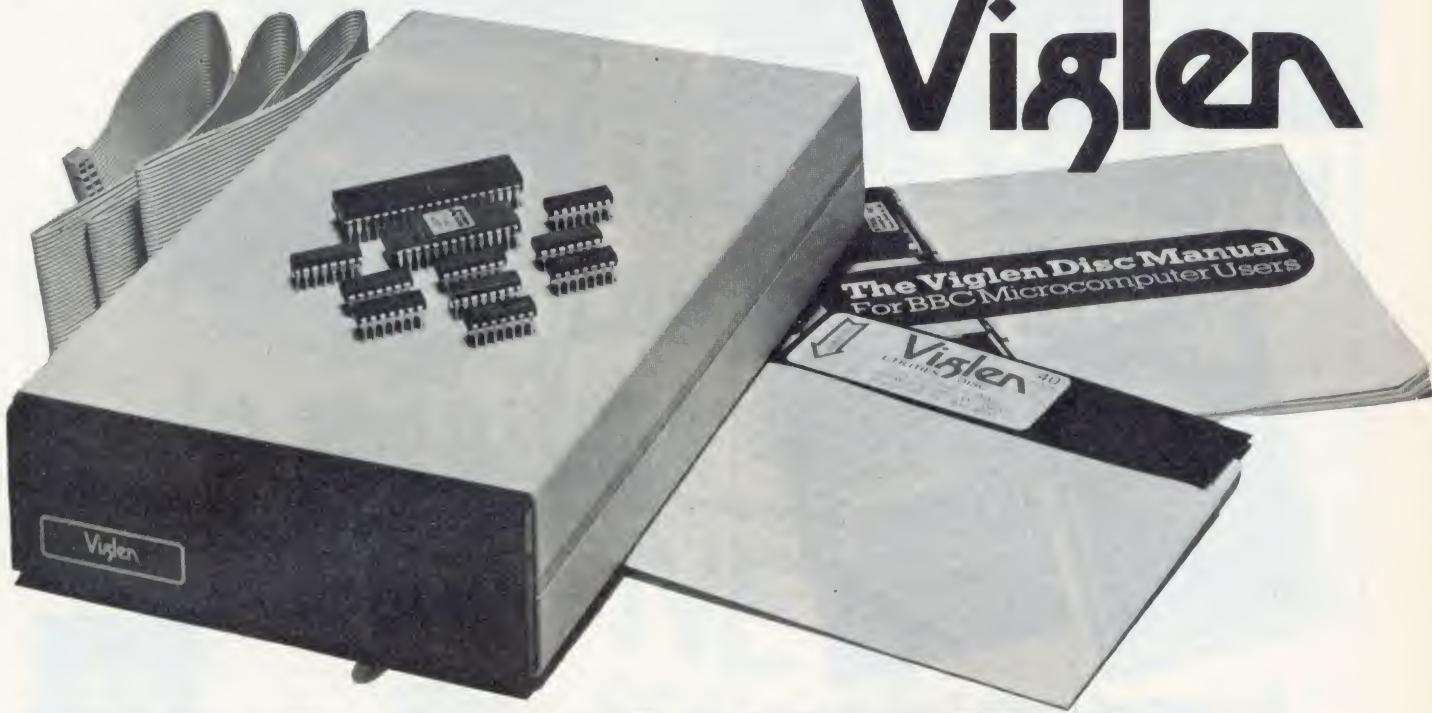
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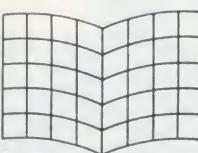


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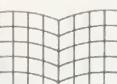
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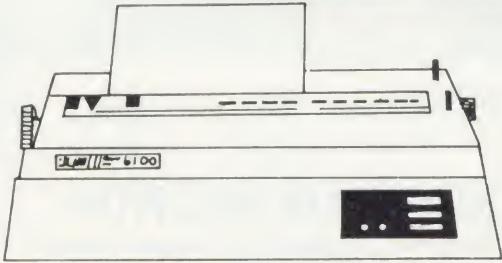
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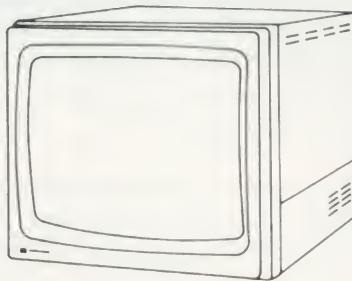
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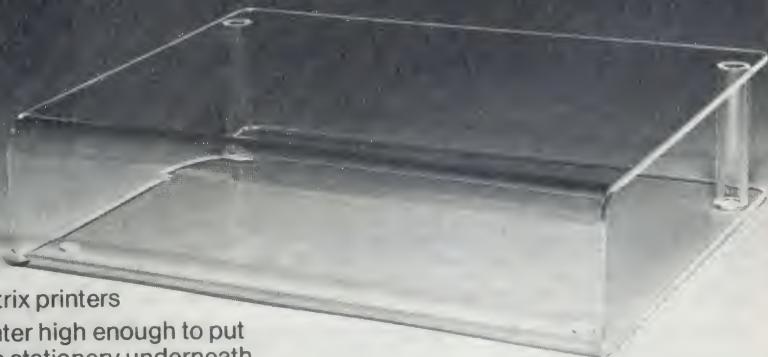
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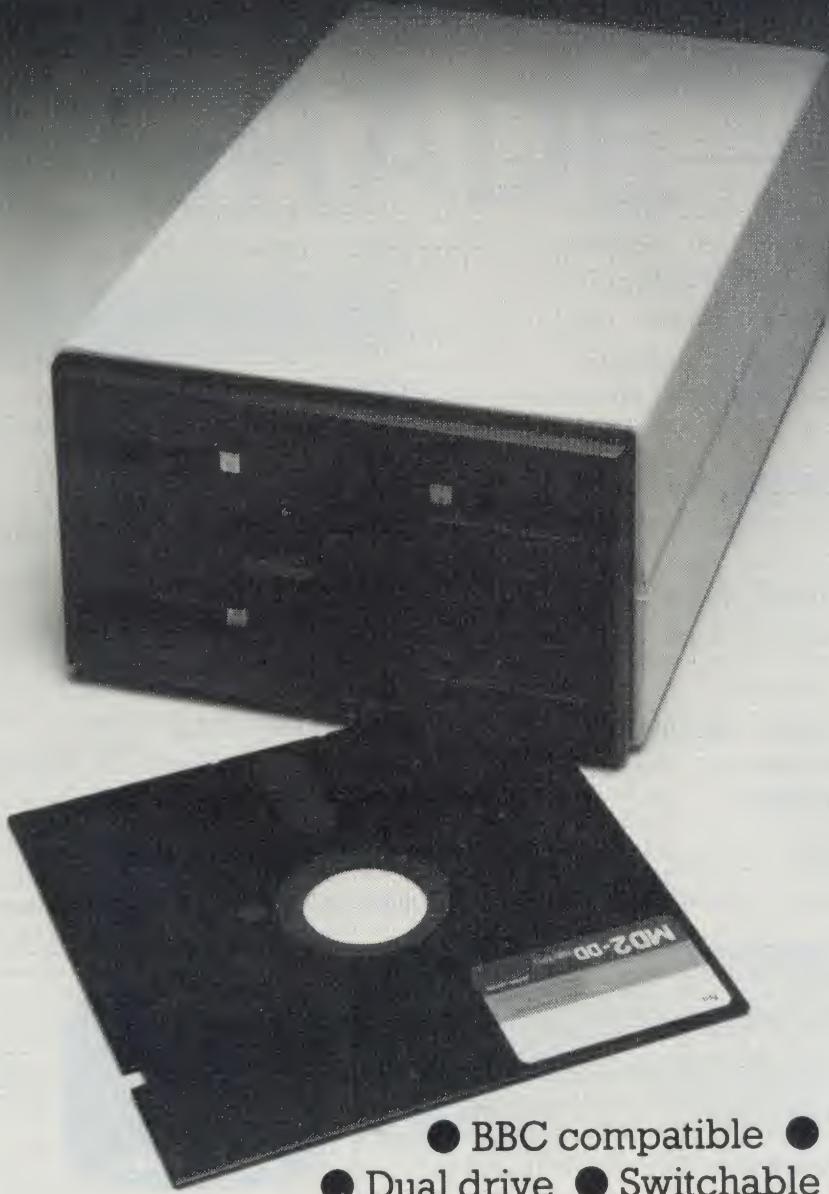
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Editorial Address: ORBIT, PO BOX 50, St Albans, Herts.

# THE ADE UPGRADE

System's assembler/debugger/editor  
ROM wins praise from Vincent Fojut

**T**HE ADE ROM from System Software is a sophisticated suite of programs guaranteed to whet the appetite of any assembly language programmer. The heart of the package is a new macro-assembler, complete with library facilities. This takes ASCII source files, prepared on the comprehensive editor, and generates a file of object code, or executable machine code, which can be run and tested under the debugger. These three primary functions give the package its name - Assembler, Debugger and Editor, or ADE for short.

The system comprises a 16k ROM, a utility disc (table 1) and sizable manual. Once the ADE ROM is activated (on power-up or by typing \*ADE), the extra commands listed in table 2 are at your disposal. The three major modules are

by \*NOCTRLF). Yet another way of entering the SPY utility is by using the \*FX100 command (or its machine code equivalent) from within a user program, or ADE command level.

The \*LST command calls up a 6502 disassembler, which is in fact part of the SPY utility but can be used independently. Finally, \*MODE works in the same way as the MODE command in Basic. It is included to allow an 80-column mode to be selected before an assembly. Otherwise, in a 40-column mode, the assembly listing is truncated at column 39.

To show how the elements of the system inter-relate, figure 1 (overleaf) represents a typical sequence in the development of an assembly language program. First, the editor creates (or modifies) an assembly language text

The ADE package can be obtained from System Software, 12 Collegiate Crescent, Sheffield S10 2BA, priced at £60 (incl VAT). An enhanced version of the SPY debugger, SPY2, is available separately, at £24.15.

stage. If errors are present, the edit and assemble phases are repeated until a 'clean' or error-free assembly is obtained. However, a lack of errors at this stage signifies only that the source code is recognised as valid by the assembler; it does not, of course, mean that there are no logic errors in your assembler program. Hence the need for a final testing and debugging phase, using the SPY monitor, to help track down and eradicate any outstanding bugs. If any bugs are present the process is repeated from the start - editing, re-assemble, and re-testing - until a bug-free, fully-tested program emerges.

The editor makes use of the mode 7 screen, which is divided by a 'status' display into an upper 'text' area and a lower 'command' area. The user may toggle between the two areas via the escape key. While entering text, in what is referred to as 'immediate' mode, the same text-manipulation functions can be achieved either by control-key combinations or by function key. For example, both f6 and ctrl-O allow you to mark a point in the text. I took the manual's advice and found the function keys to be simpler to use (only one key to hold down, as opposed to two), and the function key strip provided eliminates constant referrals to the manual.

Alternatively, text can be modified via 'deferred' commands which are entered in the command area. Deferred commands can be strung together in blocks, up to eight levels deep, any (or all) of which can be iterated a specified number of times. For instance, the sequence:

5<FSmith/e/=XJohnson/e/>/e//e/

```
*HELP ADE
ADE 1.00
ADE
ASM <fsP> <ofSP>
BRK
CTRLF
ED <<fsP>>
EDIT <<fsP>>
FX100,<lo>,<hi>
LST
MODE <n>
NOBRK
NOCTRLF
SPY
```

Table 2. ADE command level - extra OS functions

T.LIBRARY	macro librarian (source code)
LIBRARY	macro librarian (object code)
T.SYSLIB	source code for common macros
SYSLIB	library of common macros
T.DEMO	demonstration Program (source code)
D	demonstration Program (object code)
T.FMT	text formatter (source code)
T.RDV	source code used in demonstration
RDV	object code run in demonstration

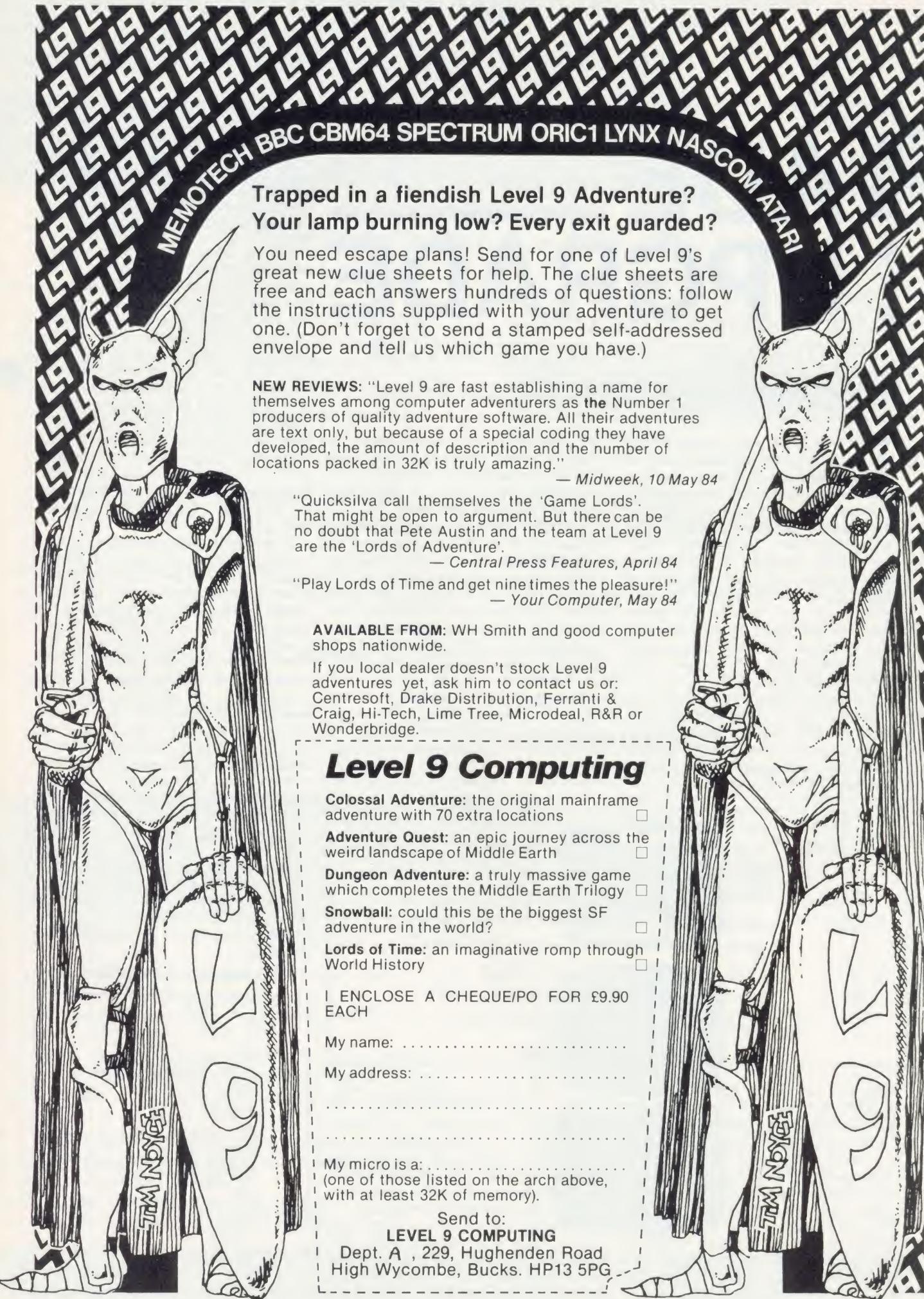
Table 1. ADE utility disc files

initialised by typing \*ASM, \*ED/\*EDIT or \*SPY, which invoke the assembler, editor or debugger respectively.

The remaining sundry commands are mostly intended to assist the debugging process. The \*BRK command forces the SPY debugger 'front panel' to be entered whenever a 6502 BRK instruction is encountered. This facility is deactivated with \*NOBRK. Similarly, typing \*CTRLF allows the SPY monitor to be invoked by pressing the CTRL and F keys whenever a program is awaiting user input (disabled

file (it can also be used for the preparation of documentation to accompany the program, or indeed, any general word-processing functions). Assuming, for the moment, that an assembler text file has been generated, this then becomes the source, or input file, for the assembler module.

The assembler, in turn, converts the source code into machine code and generates an output file of object code which can be directly executed. An optional assembler listing can also be produced on screen or printer at this



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L	-disassembly/Hex display toggle	"	-enter characters into memory
M	-set UP Memory Pointer	P	-fill & test area of memory
Return	-increment Pointer by 1	S	-shift area of memory
+ or	-increment Pointer by 8	V	-verify (compare) 2 memory areas
/	-decrement Pointer by 1	.	-move to next register
-	-decrement Pointer by 8	<HEX>,.	-modify register
U	-set Pointer to value of PC	Z	-single-step
@	-set PC to value of Pointer	J	-jump to address and run program
I	-set Pointer from memory (indirect)	K	-continue program execution from PC
R	-set Pointer from memory (relative)	*	-0.S. command prefix
G	-find byte Pattern	#LST	-activate disassembler
N	-find next occurrence of byte pattern		

Table 3. SPY debugger commands

(where /e represents one depression of the escape key) would change five occurrences of 'Smith' to 'Johnson'. Using the escape key as a string terminator (as well as command terminator) seems odd at first, but there are advantages. For one thing, it means that search and replace strings can contain the 'return' character within them. In other words, you can find and/or replace blocks of text which span more than one physical line.

Even more versatile is the ability to set up command sequences as 'macro' commands, which can be executed either in command mode or in immediate mode, by pressing the COPY key at any point within the text.

A text formatting program is included on the utility disc to give the editor word-processing capability. Indeed, the manual (a fine piece of documentation) was prepared using ADE's editor.

The BBC micro is already equipped with a very capable assembler, complete with conditional assembly and macro facilities, so how does the ADE assembler compare?

Since the source file is generated and saved separately by the editor and is never wholly resident in memory the only limit on assembler file sizes is that of the discs being used. If a tape system is in use, the object code is written to memory, as opposed to an output file directly, so in this case there is a limit on file size. The format of each line in an ADE assembler program is:

```
<label> <opcode> <operand>
<comment>
```

Each element on the line can be separated by spaces, or a tab character, which is expanded by the listing routine. This allows neat, formatted output without using up valuable memory. The label, if entered, can be of unlimited length, but only the first six characters are significant. For obvious reasons, try to limit your labels to six characters or less. This is the only point where I could fault the ADE assembler in comparison with the BBC version, but even then, the six-character restriction results in more acceptable assembler listings.

All labels are translated by the

assembler into upper-case. I was very pleased not to have to keep changing cases when entering mnemonics and symbols, which can be an irritation on the Beeb. The only reserved word in the assembler is the single letter A, for the accumulator addressing mode, so any other sequence of alphabetic characters is a valid label - even "mnemonics" such as LDA or STX can be used as labels (though they are not recommended).

Entries in the opcode field can be either a standard 6502 instruction mnemonic, an assembler directive, or the name of a predefined macro (a labelled sequence of commonly used instructions). A library of macros can be set up using the PUT command, and retrieved from the library file at assembly time with the GET statement.

Operands, if required, consist of an expression built up from symbols, arithmetic operators and constants. The following prefixes allow constants to be expressed in a number of forms:

no prefix	- the default - a decimal number
\$ or &	- a hexadecimal number
%	- a binary number
'	- an ASCII character value

A wide selection of data definition directives are also available.

Comments are separated from the rest of the line by either a ';' or '\'. Alternatively, an asterisk in column 1 denotes the whole line as a comment.

Conditional assembly in ADE is achieved by embedding code within IF ... ELSE ... FI (ie, ENDIF) directives. These can be nested up to eight levels deep. An additional command, QUERY, allows the values of labels to be changed from the keyboard during assembly to set the appropriate conditions required.

For all its assembly language powers, the unenhanced BBC micro has deficiencies when it comes to machine-code testing. The SPY debugger goes a long way towards correcting any shortcomings. The 'front panel' of the SPY utility gives a display of all internal 6502 registers and flags, together with a program/data area memory block and details of the hardware stack contents (a nice touch).

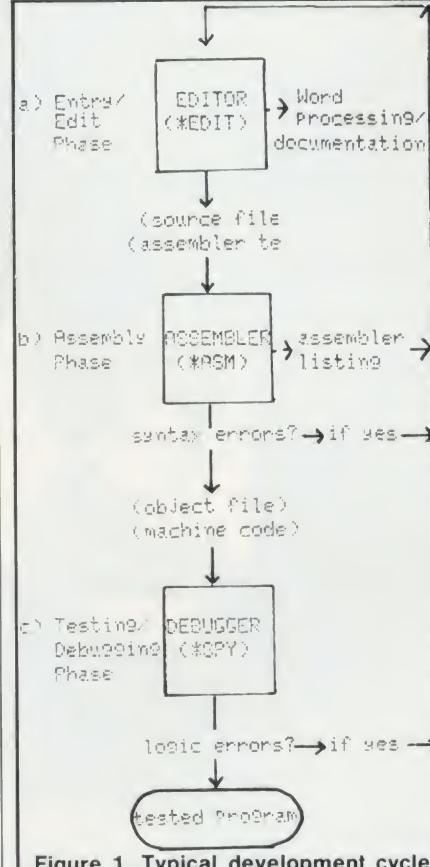


Figure 1. Typical development cycle using ADE

Breakpoint handling is rather basic, but with the ability to stop programs using \*FX100 or ctrl-F the result is a versatile package. I found the single-step feature particularly useful. There is the typical selection of commands to step forwards and backwards through memory, alter memory contents and registers, find specific byte patterns, and so forth. A brief summary of SPY commands is given in table 3.

Of course, the cost of ADE (and its range of facilities) shows that it is not aimed at the occasional dabbler in machine code. But when you consider that you are getting an enhanced assembler, capable debugger and an editor which doubles as a perfectly acceptable word-processor, £60 is not a high price to pay. Any programmer who does a substantial amount of assembly language work should give it serious consideration.

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- \*BIG Prints enlarged characters in any graphic mode.
- \*CENTRE Centres text in any standard screen mode.
- \*DEFCHAR Defines characters on a grid and enables a 'macro' character of 16 x 16 pixels to be created, which then can be saved to disc or tape.
- \*DEFLIST Lists all defined procedure and function names.
- \*FIX Repairs a 'Bad Program' and then 'OLDs' it.
- \*FSAVE Saves files to tape 1.5 times faster than normal, which later can be loaded with \*FLOAD.
- \*MMOVE A memory move command suited for discs and sprites.
- \*TAPEDISC Takes a specified number of files from tape and puts them on to disc, preserving file attributes.
- \*VARYLIST Lists all declared variable names in a program.

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## JOB FOR YOUR

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'Interfacing Projects for the BBC Micro' by Bruce Smith, Addison-Wesley Publishing, 134 pages, £6.95

AMONG the multitude of computer books that you can find on almost any bookseller's shelves, you will find few relating to the subject of interfacing a machine to the world outside. In the headlong rush to become a computer literate society, we are in danger of overlooking this aspect of computing, and yet it is one that we encounter every day, and the one that is having the most profound effect on our lifestyle.



As it happens, the design of the BBC Micro – and, indeed, the Atom – is particularly suited to real time control and data capture and this slim volume will start you along the road to a new horizon.

Written by Bruce Smith, it begins by introducing you to the arithmetic and electrical concepts behind the various user ports and shows you how to read and write to them. Chapter 3 is devoted

to the VIA port and gives a detailed description of the lines and controls available on the 6522, which is used for control in all the book's projects. Chapter 4 shows you how to use the indirect addressing that Acorn prefers you to use (to make things compatible with the Tube) and chapter 5 details the physical connection points before describing the construction of a multiple output power distribution board.

The rest of the book puts theory into practice by describing projects for you to build. These comprise: an automatic light switch; a door bell and rain detector (presumably in case you live in a house without windows!); a temperature monitor; sound detector; joystick controller; light pen; D/A converter; light sequencer (disco lights); EPROM programmer; and finally, and best of all, an X-Y plotter. The saving on this last item alone is well worth the price of the book.

All the projects are described in simple, easy-to-understand language and would be suitable for anyone with experience of wielding a soldering iron. All the projects in the book are available in kit form from Watford Electronics. Do not be misled by the title. Most of the projects are suitable for the Atom as well (I understand that many were developed on the Atom) and the translation of the control programs is an easy matter.

So here is a book different from the norm, simply and clearly written. It is recommended for any Beeb or Atom owner who wants really useful applications for his machine. **Barry Pickles**

## GAMES WITHOUT

### THE FRILLS

'36 Challenging Games for the BBC Micro' by Tim D Rogers and Chris Callender, Interface Publications, 270 pages, £5.95

YOU can't really expect arcade quality from a games book costing £5.95, and you certainly don't get it here. The 36 programs in this new collection from Interface are all reasonably well-written, with good use of the Beeb's features (colour, sound and user-definable graphics) but the end results are, frankly, not very exciting.

Fortunately the programs are not too long, so you don't have to spend an age before you learn how good (or bad) they are. While it is not purely a book of listings, the notes accompanying each program are sketchy to say the least, with only the briefest outline of major processes. All the same, the programs

are straightforward and not terribly difficult to follow. Meaningful variable names are not generally used, the justification being that resident integer variables enabled the programs to run as quickly as possible.

The book would, perhaps, be of use to those wishing to pick up the rudimentary techniques of writing games programs in BBC Basic. The basics are there, and those with the time and inclination could, with effort, add the frills that the games need. Perhaps this is the 'challenge' to which the book's title refers.

Verdict: pretty mediocre, but at 17p a program... **Vincent Fojut**

141

## GRAPHICS FOR

### MATHS DUFFERS

'Microcomputer Graphics' by Roy E Myers, Addison-Wesley Publishing, 282 pages, £9.95

MICRO graphics is one of my favourite pastimes. I love creating strange and wonderful patterns on the screen. Unfortunately, my maths suffers from years of neglect, so my efforts tend to be a hit and miss affair. I was, therefore, delighted to see this volume, which explains the theory behind such things as translation, rotation and hidden-line removal.

Originally published in the US, it is written in the American idea of a 'user-friendly' style. For example, chapter 6 begins 'Warning – read slowly. Mathematics ahead!' If you can live with this style of prose, the book will impart useful information, illustrated with dozens of example programs.

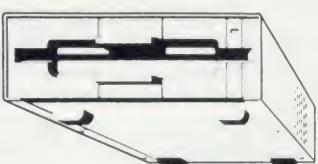
There is a considerable amount of maths to digest, but it was put simply enough for my ageing brain to comprehend.

All the programs are written for the Apple II, but the graphics commands are explained and easy to translate to Atom or Beeb Basic. In fact, the programs are almost directly translatable to both machines, since the standard Apple hi-res mode is a 280 x 192 matrix. All aspects of graphics are covered in the book's 282 pages.

The bible for graphics programmers is *Fundamentals of Interactive Computer Graphics* by Foley and Van Dam (also published by Addison-Wesley), but, as well as being quite expensive, it is written in Pascal and requires a higher degree of mathematical aptitude. This book is in Basic and starts at a much simpler level and I would recommend it to anyone interested in graphics. **Barry Pickles**

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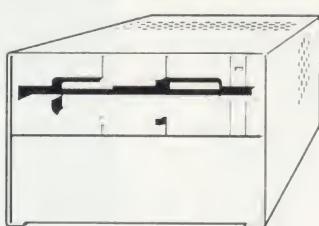
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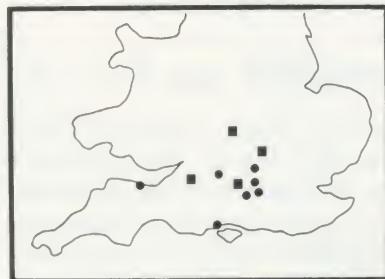
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## HANDBOOK FOR DISC USER

'The BBC Microcomputer Disc Companion' by Tony Latham, Prentice-Hall International, 186 pages, £7.95

FEW peripherals enhance the BBC micro as much as discs, and despite the price, an increasing number of Beeb owners are taking the plunge. However, sources are many and varied, as is the level of accompanying documentation. So a book that purports to give a comprehensive guide to using discs with the Beeb is more than welcome.

The book starts with an introduction to disc handling and gives a résumé of the standard Acorn DFS commands. It then goes on to file handling (both in Basic and assembler) and covers file-related Operating System routines (OSFIND, OSARGS, etc). Later chapters provide complete program listings for a number of useful disc functions, from formatting and verifying routines to a simple text-handler or word-processing program. To round off, the author gives technical details and performance characteristics of the popular disc variants available.

Much of the material will already be familiar to prospective readers, being available in some form or other in various documents. For example, those already using discs will presumably already have a list of the commands available with their DFS. Similarly, most users will almost certainly have a formatter/verifier at their disposal. On the other hand, there is something to be said for having all disc-related information, even if duplicated, present in a single volume. Even existing disc owners may find useful information in the chapters covering file handling and random access, for example.

As for the provision of format/verifier routines, the author argues that disc drives originally intended for other (older) computers could be put to use with the Beeb, providing discs can be formatted appropriately – hence the programs. For this reason, the book could prove particularly attractive to schools and other establishments with limited resources eager to make the most of existing equipment.

*Disc Companion* may be beneficial to those considering acquiring discs. The well-rounded overview of disc usage with the BBC micro should help clarify any outstanding areas of confusion, and provide useful guidelines for making the right purchase.

Vincent Fojut

## FUN MATHEMATICS ON YOUR MICROCOMPUTER



CZES KOSNIEWSKI

## DOESN'T ADD UP

'Fun Mathematics on your Micro-Computer' by Czes Kosniowski, Cambridge University Press, 195 pages, £4.95

THIS book aims to cover some areas of mathematics, illustrating the subject by the use of entertaining computer programs. The choice of topic is broad, covering school mathematics and areas not taught outside universities.

Having read the contents page, I was very disappointed by the rest of the book. It gives an impression of having been written down in one go and never checked. Time after time the author fails to explain terms before he uses them, and sometimes doesn't explain them at all.

The subject-matter is, however, interesting and this book could have a role in computer clubs where experienced help is at hand. It might particularly interest the A-level mathematician who wants to broaden his mathematical knowledge.

Like many things in the world of personal computers this book claims to be more than it is. It does not teach mathematics, but merely describes parts of the subject. Never before have I seen someone claim to teach differential calculus in two pages.

Neither is it, as it claims, a book for the computer novice. The programs are not simple, and are complicated by Czes Kosniowski's approach to the computer author's bogeyman, portable Basic. He has tried to write programs (using his ACT Sirius 1) that are easily adapted for many different personal computers. The result is programs that will please no-one: verbose and unstructured in the extreme, and using a very small subset of Basic.

I cannot recommend this book.

Jeremy Bennett

# The Aries File

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### WHAT THE PRESS SAID

"the most exciting add-on"

- Times Educational Supplement, March 1984

"a very professional product"

- A & B Computing, March/April 1984

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- Beebug, March 1984

"this is an impressive piece of equipment in its own right and deserves to be taken seriously"

- Acorn User, April 1984

"the trouble with a paged RAM system is that the software has to be aware that it is there. The Aries RAM board gets round this limitation brilliantly"

- The Micro User, June 1984

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# SOFTWARE CHART

TITLE	PUBLISHER	PRICE	MICRO
1 (1) Snooker	Visions	£8.95	B/E
2 (11) Twin Kingdom Valley	Bug-Byte	£9.50	B
3 (3) White Knight 11	BBC Soft	£10.00	B
4 (2) 747 Flight Simulator	Doctor Soft	£8.95 (£11.95)	B
5 (19) Hopper	Acornsoft	£9.95	B/E
6 (5) The Hobbit	Melbourne House	£14.95	B
7 (14) Chuckie Egg	A&F Software	£7.90	B/E
8 (16) Hunchback	Superior	£7.95 (£11.95)	B
9 (13) Fortress	Pace	£8.95	B
10 (18) 737 Flight Simulator	Salamander	£9.95	B/E
11 (—) Ghouls	Program Power	£7.95	B
12 (8) Killer Gorilla	Program Power	£7.95	B/E
13 (10) Zalaga	Aardvark	£6.90	B
14 (9) Gorph	Doctor Soft	£8.95	B
15 (4) Snapper	Acornsoft	£9.95	B/E
16 (17) Dare Devil Dennis	Visions	£8.95	B
17 (—) Lords of Time	Level 9	£9.90	B
18 (—) Cylon Attack	A&F Software	£7.90	B/E
19 (—) Dodgy Dealer	O I Consultants	£6.50	B
20 (6) Transistor's Revenge	Softspot	£7.95	B

B=BBC E=Electron Prices in brackets are for disc version

## BUBBLING UNDER

Hulk (Adventure International)  
 Empire (Shards)  
 Jet Power Jack (Program Power)

Compiled by RAM/Computer

Pengwyn (Postern)  
 Battle Tanks (Superior)  
 Aviator (Acornsoft)

NO NEW Top Ten entries in this tasting of the vidiot universe—the nearest is the pitter-patter of tiny Ghouls at number 11. The chart seems to have settled down, with several favourites keeping their position for at least three months.

Among these are *Snooker*—one of Visions' releases from last year—*Snapper*, *747*, *Twin Kingdom*, *Hobbit*, *Chuckie Egg*, *White Knight*, *Zalaga*, and the not-so-tiny feet of *Killer Gorilla*.

It's quite amazing to think that in this, our second

birthday issue, *Snapper* is still going strong. It made its appearance, along with Acornsoft's *Defender* and *Monsters*, in the first-ever issue of *Acorn User*.

Another in the adventure style has appeared, *Lords of Time* from Level 9, a publisher that certainly appears to be keeping up its quality. Then *The Hulk* is bubbling—undoubtedly the result of large orders from the multiple stores, as we haven't seen a copy yet.

## SOFT OPTIONS

OPTIMA Software's latest release for the Beeb, *Bedbugs*, certainly comes up to scratch. This original arcade game has already had some mothers up in arms as jam sandwiches come to the aid of the game's bedbug-ridden hero.

*Castaway* is a new adventure game from **Simonssoft**, set in mode 7 graphics. Irate gardeners, beanstalks and priggish chemistry teachers are among the problems you'll encounter on the 'Three Island Adventure' as you go in search of priceless treasure.

A sealed envelope is provided for defeatists which offers them hints.

*Computer Assisted Table Bingo* is **Resource Facilities'** way of making the learning of multiplications from 1×1 to 10×10 enjoyable for children (or adults!). Calls are made for a 'line' or 'house' when a player obtains three or nine correct numbers respectively. Tel: (0422) 65935.

*Integrated Accounting* is business software for the Beeb from **Diamondsoft**. The software is supplied on 40-track disc and comes with a comprehensive user manual. Features include areas such as purchase ledger, sales ledger, nominal ledger, cash book and VAT analysis. Tel: (061) 485 8705.

*One-Disc Home Office* from **Doctor Soft** provides the first integrated program for the Beeb to offer word processing, an address database and spreadsheet linked together on a single disc. The disc is supplied with a 12-page manual. Tel: (0903) 206076.

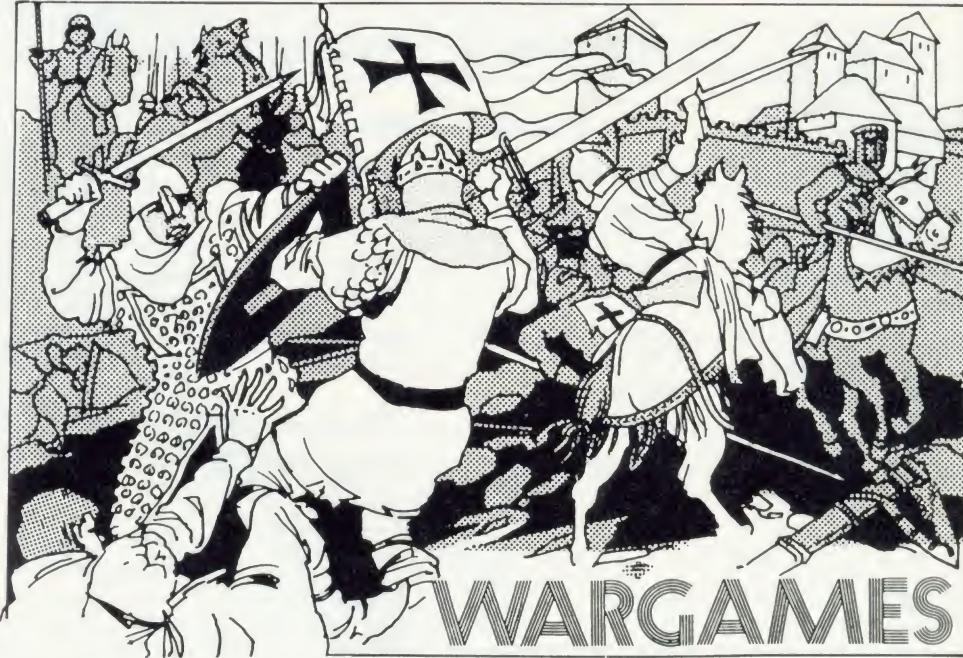
The microdisc invasion gathers pace as **Beebugsoft** breaks into the new 3½in market with six titles. If your spelling is really bad then *Spellcheck*, for use with Computer Concepts' Wordwise will be of interest. It takes a Wordwise file and searches through it for spelling mistakes, highlighting any it encounters so that you can then edit. Rent-a-ghost becomes reality with the *Sprite Utilities* package, and the other titles are *Masterfile*, *Teletext Pack*, *Paintbox* and *Design*.



# Software News

INNOVATIVE  
BBC SOFTWARE

*from the professionals*



Computer wargames are played against the background of a map. On the BBC these are particularly attractive. All the games are played in a similar manner. Troops are moved from one area to another, taxes levied, and so on. Battles are fought and wars are won or lost.

#### WILLIAM THE CONQUEROR

The player takes the part of William, Duke of Normandy, in 1047. William's Duchy consists of eight provinces, and the purpose of the game is for William to establish complete control over his realm, which is no small task. He dies in 1087. A good player will not only hold the original provinces, but also have captured two others. He must also, incidentally, have successfully invaded England.

#### KING ARTHUR

Most wargames stretch to a couple of hours, some longer. King Arthur is a short one running about twenty minutes. Set in the time of the Anglo Saxon invaders, King Arthur must protect this island and hopefully drive the Anglo Saxons into the sea.

#### EMPEROR

The scenario is the first four centuries A.D. in the Roman Empire. The player takes the part of the Emperor and must pit his wits against invading Barbarians, rebellious provincials and treacherous Roman generals. Even the Plebs of Rome will have to be placated with bread and circuses if the Emperor is to keep his head and his throne. In that Emperor is played against the background of the biggest geographical area of all our wargames, it is probably one of the most interesting.

#### CRUSADERS

The player takes the part of the King of Jerusalem, and has to rule his kingdom from 1169 to 1177. The ultimate aim is to prevent any incursions by the invading Saracens. There are a total of 48 fortresses, all interconnected by caravan routes. The program has a rudimentary artificial intelligence, inasmuch as the Saracens attempt to siege and take castles and fortresses that they have not previously moved to. Thus, a Saracen army that has been sieging for a few years may be reinforced by a new army.

#### NAPOLEON

Unfortunately Josephine does not appear, but Napoleon is probably one of the most absorbing wargames in that it was such an interesting period of history. Needless to say, the object of the game is for Napoleon Bonaparte (the player) to conquer Europe completely. Battle commences in June of 1798 and the player has until the end of 1815 in which to manoeuvre the initial six armies in such a way as to defeat the opposing forces.

Any one wargame (excluding King Arthur) ...	£13.50 + VAT = £15.53
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## RIDING HIGH

## WITH DENIS

'Daredevil Denis', Visions, BBC B and Electron, £7.95

COMPUTER game writers have fertile imaginations. It never ceases to amaze me how a similar concept in a game can be presented in so many different ways. Take *Daredevil Denis*, for example. It represents a novel approach to getting from one end of a screen to another while jumping over or ducking under various objects en-route – a *Killer Gorilla* type of game, but with some original effects.

The object is to manipulate Denis, a stuntman, around three scenarios. These are land, where Denis rides a motorcycle; sea, where he controls a wetbike (a James Bond contraption); and snow, in which Denis dons his skis. The screen display consists of four evenly spaced horizontal lines, representing the landscape, and Denis rides (or skis) along the landscape from the top line to the bottom.

Denis' progress can be controlled from three keys: space bar to jump, Shift to accelerate, and Return to stop. There are six skill levels, ranging from Novice through Oscar Nominee to Ace, within



each of which there are six intermediate stages.

Among the original effects is the 'Denis the Stuntman' theme, which holds it all together. This is carried through even to the high score table, which shows your achievement in terms of wages earned. Each new life (there are three) is announced with the slam of a clapper-board closing (this is a film set, after all) and a new 'take'.

But there are irritating things about the software. Although the sprites are well defined, and there are 30 of them, the screen has an empty look. The graphics can be unpredictable when there is a crash and this can detract from the realism of the game. On the plus side, however, the break key is disabled, including control/break. The sound

effects are good, especially those when Denis is on skis. The graphics are smooth during a jump, and a crash is fun to watch at first as Denis is thrown from his vehicle and lands upside-down flailing his legs.

*Daredevil Denis* seems to have been written with a sprite-making package, yet despite its well-defined characters the screen display is a disappointment. Nevertheless, I found the game quite challenging and the higher skill levels proved difficult. A pity the screen isn't more fully utilised.

Dee Vince

These are small complaints about a good idea which will give pleasure to the many bridge-playing model B owners and the game is entertaining and useful at a reasonable price. A much more sophisticated version is apparently coming.

Roger Carus

## BRIDGE WITH A

## FEW GAPS

'Contract Bridge', Alligata Software, BBC B, £9.95

THIS piece of software will give great pleasure to keen bridge players although it has limitations. Load it and you can get excellent practice at bidding and playing hands with infinite variation. It plays near standard if a little conservative Acol-type bidding with pre-emptive jump bids, strong two and Stayman convention.

You play south except when north is declarer, so half the hands are yours to play. You are offered the hand and previous bids, and a prompt asks you to call. You can see the last trick, faintly visible on the screen. Once contract is reached you play normally, the tricks being counted for you. At the end of each trick all the hands are revealed and you can analyse the bidding and play at leisure before going on with the exercise.

*Contract Bridge* provides very good entertainment and my impression is that the proportion of hands with unusual distribution is above what would be expected, although that tends to add interest.

There are limitations to the program that are not obvious from the description on the box, and it is as well to be aware of them in advance. There's no scoring or provision for doubles, and each hand stands alone, so bids such as the take out double which might be conditioned by such situations are not supported. Nor is there a means of declaring, so you must play every hand out to the bitter end, and the absence of a slam convention makes the frequent long, strong suits hard to make the best of in bidding. More annoying was the fact that the machine plays a little too fast for me, especially when any of the hands, including declarers, is without a choice. Finally, there's a bug in the program that I was unable to trace which gives 'No room at line 6650' about once an hour, apparently at random.

## HOLOCAUST IN

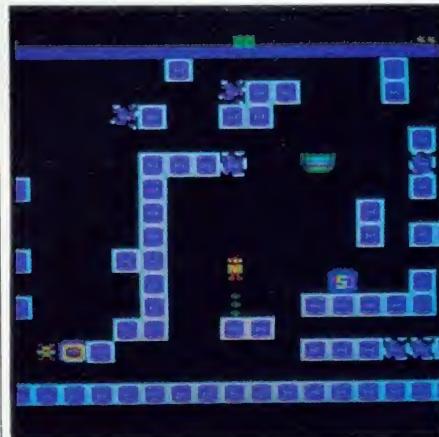
## THE HOLD

'Demolator', Visions, BBC B, £6.95

THE Demolators are ghost-type nasties whose sole aim is to destroy the human cargo held in cryogenic suspension aboard the Battle Star Quinn (Visions denies that it is named after AU's illustrious editor!) as it transports the last remnants of Homo sapiens across the galaxy. Patrolling the cargo bay is the Phobe, the ultimate robot, and you have to manoeuvre it around (with keyboard or joystick), picking off the aliens. The Demolators have the advantage, though, of being able to move through any objects they encounter, whereas the Phobe must dodge these obstacles, at the same time taking care not to blow itself to bits on any of the mines lying around.

Points are scored by zapping the Demolators with the inevitable ultrasonic cannon.

The Demolators have their allies,



too. The Minor is a real beast. He appears randomly and if you don't zap him he mutates into a deadly mine which cannot be destroyed and eventually the Phobe can be hemmed in. The Protector is a bit like a mobile Minor that fires back (not very nice), while the Tracktor actually homes in on you.

*Demolator* is well-presented, making good use of sound and colour. The graphics are very good, and excellent, flicker-free use of sideways scrolling gives a good impression of travelling down a long cargo hold.

The game gets more difficult as you progress and it apparently has 24

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stages – I couldn't get past stage 4 after about an hour's practice. The game is complete when you have used up your available lives, of which you have three.

The verdict: slightly above average, with good graphics. **Bruce Smith**

## WIREFRAME

### ENEMY

'3-D Tank Zone', Dynabyte Software, BBC (32k), £8.95

THIS offering from Dynabyte follows Acornsoft's *Aviator* as an innovative piece of software that makes use of the Beeb's fast processing speed at machine level to produce three dimensional wire-frame graphics. For the uninitiated wire-frame means that the object, in this case a tank, is displayed simply as a 3D outline figure, with little or no detail. This doesn't mean the effect is unrealistic. On the contrary, it stimulates the imagination and I prefer it to minuscule overdetailed characters.

Once *3D Tank Zone* is loaded you find yourself at the controls of a tank looking out onto a landscape containing a multitude of pyramids (or are they hills?). The turret may be rotated to face one of the other three points of the compass to show missile silos, part of a city and what look like volcanoes erupting in the distance.

The on-board radar, which is rather disappointing, shows a single point to represent the position of an attacking enemy tank, located visually by swinging the turret around. By using the keyboard or a joystick the sights of the anti-tank missile launcher are aligned and the deterrent launched. This process is harder than you might expect. The sights are not the cross-wire type but move up and down the side of the screen and across the top of the screen, so it takes some skill to line them up. The marauder is also manoeuvring smoothly at an often unpredictable speed so he's easy to miss. Once launched, the missile whistles away and if you're on target the enemy tank is obliterated – and another appears on the radar screen.

In the skies waves of lifelike jets and helicopters are on the attack. You can shoot them down using the on-board anti-aircraft cannon, the sights for this being the standard cross-wire type. Only one weapon can be fired at a time.

Points are awarded for destroying any enemy hardware, tanks carrying the greatest value. The object of the game is to destroy as much of the enemy before he pops your clogs, so an eye needs to be kept on the condition of the energy banks.

As with many of the programs marketed today, little information about the program is provided on the card insert. I wish software houses would at least print the key/joystick functions so that they may be readily referred to. It's annoying to have to reload the program to note them down.

Really, *3D Tank Zone* follows the old familiar pattern – zap-zap, bang-bang – which is disappointing. However, the graphics are its main selling point and they work exceptionally well, not up to the *Aviator* standard but an honourable second.

**Bruce Smith**

## GALLONS

### OF TROUBLE

'Jet-Power Jack', Micro Power, BBC B, £7.95

JET-POWER Jack, the inter-galactic hitch-hiker, has been kidnapped. His captor is no less a character than Nogrob the Terrible, who runs the Botch system.

Jack is held in a garage and must recover vital fuel pods to refuel the waiting starships. As usual, his oxygen supply is limited, so he has to be quick. The garage is filled with obstacles, but luckily Jack has a turbo-booster on his back (the Jet-Power) so he can move from level to level. In doing so, he must avoid the live light fittings in the ceiling and the edges of the platforms.

There are five sections, each with five fuel pods. The stages become progressively harder, until Jack meets Wilfred the hideous Yugg monster on section five!

The sounds used are simple but effective, and may be switched off at the start of each new game. The graphics are fair rather than excellent. The



movement can be less than smooth, but this fault is not serious. Colour has been used well and some of the monsters look really mean!

Controlling Jack is easy, using only three keys. 'Control' and 'A' govern

horizontal movement, while 'Return' fires the rockets on Jack's power pack.

You can begin a new game at any level, a good idea for all games. If you get tired of playing, Escape takes you back to the top-ten scoreboard.

*Jet-Power Jack* is great fun, addictive, quite frustrating at times and, best of all, good value for money.

**Stuart Menges**

## YOUR SEARCH

### THROUGH TIME

'Lords of Time', Level 9, BBC (32k), £9.90

LEVEL 9 – arguably the producer of the best adventure games in the UK – has done it again. *Lords of Time* is a sparkling addition to its stable of winners, with more than 200 beautifully described locations and a repertoire of witty ripostes to even the dumbest instruction.

The game's theme involves nine evil Timelords who have meddled with Earth's history so that they can rule eternally. Father Time recruits the player (that's you) to travel through time and put an end to their dastardly deeds by collecting nine 'symbolic objects' which, he assures you, can repair history. On the way there are, of course, plenty of valuable knick-knacks to be picked up, ensuring a comfortable retirement for the weary time-traveller.

The game is divided into nine time zones – nine separate adventures in different periods of the Earth's past and future – interlinked in that objects found in one zone are needed to solve puzzles in another.

There are some useful additional features – for instance, longer phrases can be entered, such as 'Give drink to bartender'. This makes the game more realistic and gets away from the endless repetition of 'Take' and 'Drop'. Also, if you want to know more about an object before you pick it up, you can examine it and get a more detailed description. This might range from the cryptic (Examine candle – 'wax') to the helpful (Examine suit of armour – 'Just your size!').

Full marks to Sue Gazzard for an ingenious and entertaining game design, and to Pete and Mike Austin for its excellent implementation. Response time is fast and – most important – you can restart the game without re-loading an initialisation data file (other game writers please note).

Oh well, back to the keyboard – yes, I confess, I haven't actually cracked *Lords of Time* yet! Now where did I leave the Galactic Groat? Was it on the ice-age glacier or in the Tudor hedge-maze?

**Mike Milne**

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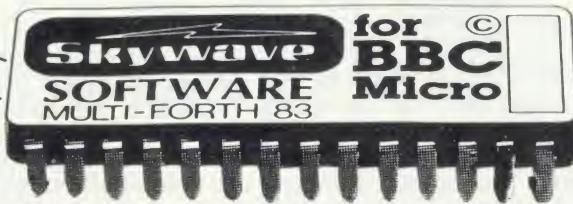
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It's Multi-Forth 83 from David Husband who has built his reputation for Quality Forth products with his ZX81-Forth ROM, Spectrum Forth-I/O Cartridge and now New Multi-Forth 83 for the BBC Micro. This is not rehashed Forth 79 Code, but a completely new version of the Forth 83 Standard. It's unique in that it Multi-tasks, and therefore the user can have a number of Forth programs executing simultaneously and transparently of each other.

Multi-Forth 83 sits in the sideways ROM area of the BBC along with any other ROMs in use. It is compatible with the MOS, and specially vectored to enable a system to be reconfigured. It contains a Standard 6502 Assembler, a Standard Screen Editor, and a Unique Stack Display Utility.

With this Forth, David Husband has provided the BBC Micro with capabilities never before realised. And being 16K rather than 8K is twice the size of other versions. Multi-Forth 83 is supplied with an

extensive Manual (170 pages plus) and at £40+VAT it is superb value.

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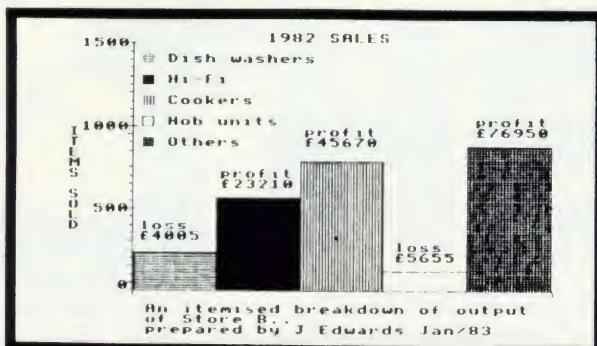
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	Gross Profit 564	101
	Income 257	
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Centred Moving Average	YES	YES
Rise and fall indicator	YES	YES
Weekly/Daily Low indicator	YES	YES
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# IT'S FASTER VIA THE SILICON DRIVE

**Sideways RAM board (128k), Solidisk Technology, 17 Swayne Avenue, Southend-on-Sea, Essex SS2 5JJ (0702) 354674, £139.95 (inc VAT)**

In HIS review of the 16k version of Solidisk's sideways RAM system (February issue), Vincent Fojut talked of its exciting potential for expanding the BBC micro, and explained that the board itself could be expanded in two stages to 32k and 128k. This largest version can also be bought as a complete unit which offers significant additional facilities.

Here are my experiences with the 128k version.

As the previous review pointed out, inserting wire terminals into the CPU socket alongside the CPU pins seems a little crude, and for me this proved the most tricky part of the installation. With the 128k board another five connections have to be made to the 6522 VIA and another chip. However, at least the need for permanent modification to the circuit board is eliminated and the system has proved reliable.

Used straightforwardly, the 128k board gives eight paged blocks of RAM, each of 16k, into which can be loaded sideways ROM-type software—or you can assemble your own machine-code routines directly into this area, leaving the main memory free for Basic programs and screen memory.

What really distinguishes the 128k unit is that software is supplied that enables this extra memory to behave as a 'silicon disc'. In this mode, 100k is available. The software loads a modified copy of the DFS into sideways block 8. For this purpose you must have Acorn DFS 0.90 already installed in the machine and it can be assumed that other DFS systems will not be suitable. One 16k block (sideways location 15) is still available for sideways software.

The rest of the sideways RAM now behaves for most purposes as if it were a 100k disc drive—only faster. All the normal DFS commands are recognised and obeyed, the silicon disc appearing as drive 1. If you already have a drive 1, an alternative piece of software can be loaded to make the silicon appear as drive 4.

Three new DFS commands are incorporated into the modified DFS: \*FORM40 (or \*FORM80) formats 40 and 80 track discs; \*VERIFY, according to

the instructions, or \*VFY in the software as received, verifies either the silicon drive or a conventional floppy; and \*DCOPY copies the contents of the disc in drive 0 to drive 1 or vice versa. This last command behaves almost the same \*COPY \*.\* to copy all the files from one disc to another, except that if you try to copy from the silicon drive to an unformatted disc the new disc will automatically be formatted first.

\*DCOPY could be the most useful command for owners of a single conventional drive, as it enables backup copies to be made rapidly without the disc swapping normally required when using \*BACKUP or \*COPY \*.\* with a single drive. With the Solidisk board installed, one simply \*DCOPY's the floppy into the silicon disc in one operation and \*DCOPY's everything back onto a new disc in a second single operation.

The average file transfer speed is claimed to be 40k per second—up to 15 times the speed of a floppy. The speed is certainly apparent when loading program and data files, especially as no time is taken for the disc to get up to

... says Malcolm Banthorpe

still resident in sideways RAM, a large program could use data files on the Solidisk as an alternative to arrays without much loss of speed.

As well as the silicon disc program, other useful utilities were supplied on disc. Most of them involve the use of machine code routines, but in many instances source code is supplied. Solidisk Technology offers software updates at just £2 for a new disc.

*Menu* is a useful program to include on any floppy disc to be used alongside the Solidisk system. It displays the contents of all 16 potential sideways ROM/RAM locations, plus the catalogue of the floppy drive and the silicon disc (if the sideways RAM has previously been booted into this role). Any file shown can be loaded with a single keystroke.

Among the other utilities supplied:

*Silexicon*, three programs which constitute a fast spelling checker for any text file on floppy disc. A 4.5k machine code program plus a dictionary file and a 'tree table' are loaded into the silicon drive. The dictionary initially holds 5000 words and may be extended by the user up to about 15,000 words.

Operation	Floppy disc	Solidisk
*LOAD 12.5k program	2.86 secs	0.24 secs
Open data file and store 1000 6-character strings	19.69	6.01
Open data file and read 1000 6-character strings	19.49	4.78
*LOAD mode 1 screen (20k)	3.24	0.32
Store 1000 bytes using BPUT	4.75	1.66
Read 1000 bytes using BGET	4.11	1.56
Load Wordwise file of 2250 words	29.5	6.8
*BACKUP floppy to Solidisk: 20.8 seconds		
*BACKUP Solidisk to floppy: 22.7 seconds		

Table 1. How the Solidisk 128k board compares for speed with a 40-track floppy disc drive

speed. Table 1 shows how the speed of the Solidisk system compared with my single-density 40-track floppy drive in a number of typical operations.

These timings include the time taken for the floppy to get up to speed and show that, while the speed difference is not always 'up to 15 times' as great, there's always an advantage.

The speed of storing single bytes using BPUT was also compared with the time taken for a Basic program to store 1000 bytes directly to the main memory. Here the time was 0.98 seconds for direct storage—just over half the time taken to store similar information on the Solidisk system. This indicates that, though it is not yet possible to run a Basic program while it is

*Word64*, a utility for creating Wordwise files up to 64k in length as opposed to the normal 24k limit. This is achieved by holding only a 16k 'window' to the complete text file in the main memory area, the rest being held on silicon disc.

*Buffer* appears on the disc but was not documented in the instructions. It turns out to be a print buffer that sends any text to be printed rapidly to the buffer first, releasing the computer for use while the printer is at work.

If you are using a single disc drive then the Solidisk 128k system is worth considering as an alternative to a second drive. Its price compares with that of a single 40-track drive and it offers a number of advantages.

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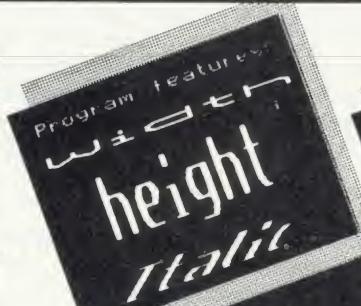
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## Paul Beverley and Nigel Eames try three IEEE488s

155

THERE are a number of standardised methods of interfacing computers to other devices and one of the more versatile of these is the IEEE488 standard interface bus. Three companies, all based in Cambridge, produce one: Acorn, Cambridge Computer Consultants (now trading as Aries Computers) and CST-Procyon.

The IEEE488 interface bus was originally developed by Hewlett-Packard as a means of communication between 'intelligent' instruments. This first version, called the Hewlett-Packard Interface Bus (HPIB) or the General Purpose Interface Bus (GPIB) was standardised and its specification published in the IEEE488 Standard of 1975, revised in 1978. Up to 15 instruments may be connected to the bus at any one time, one or more of which can control the data transfers between the others. (The IEC625 Standard, another industry standard interface, is identical to the IEEE488 except for the type of connectors used.)

Typical applications include micro-controlled testing stations for testing production instruments or running a complete set of tests on the performance of a particular system (figure 1).

Measurements of quantities such as frequency response, rise time, phase shift and many others can be made automatically and limited only by the facilities available on the 'intelligent' test gear. The computer acts as the controller, issuing instructions over the bus for the transmission and reception of data and for the function control of the instruments—for example, frequency selection, range changing, disabling and enabling of front-panel controls and pen-up/pen-down instructions for plotters. In some circumstances it is necessary to synchronise signal generation and the collection of the resultant data, and this is taken care of by the controller or computer.

The bus has 24 lines—eight for data; eight for control (three for 'handshaking' and five for 'management'); and eight ground lines. The handshake lines are used by the controller and the

peripheral devices for controlling the transfer of data over the bus. A device, often called a 'listener', indicates its readiness to receive data by putting a logic 0 on the perversely named Not Ready For Data (NRFD) line, ie, if the line is low (= Not high) it is ready for data. The sending device, often called the 'talker', places the data on the bus and sets the Data Valid (DAV) line high. The listener signals its collection of the data by setting the Not Data Accepted (NDAC) line low, ie, active low.

The IEEE488 standard bus may be run at data rates of up to 1Mb/sec, which imposes stringent conditions on the lengths and types of cables used. The ground lines form twisted pairs with each of the control lines, minimising interference between these asynchronous lines. The bus is connected in parallel to every instrument in the system either in a linear manner, one after the other, or in radiating star arrangement. The connectors on the cables must, of course, be stackable. Cable lengths are limited to 2m per instrument, or 20m overall, whichever is the shorter.

The interface management lines which are used to control the flow of

data and commands over the bus and to reflect its status are as follows:

**ATN**—When the Attention line is high this is an indication by the controller that data on the bus is to be interpreted as a command and not as data. For example, this may be used to set up a device as a listener or to disable the front panel controls of the instrument.

**IFC**—Interface Clear. This line, which is active high, is an overall reset control line and all devices capable of responding will do so. It is analogous to the BREAK key on the BBC micro and should be used only upon initialisation of a system. Only the system controller can issue this command.

**REN**—Some instruments are capable of remote operation via the bus as well as from their front panel. The remote enable REN (active high) line is used to put such instruments into the remote controlled state when they have previously been set up to receive data or commands.

**SRQ**—Service Request. This is the line, or flag, used by the peripheral devices to request servicing in the event of an error condition or some circumstance beyond its control—eg, input signal out

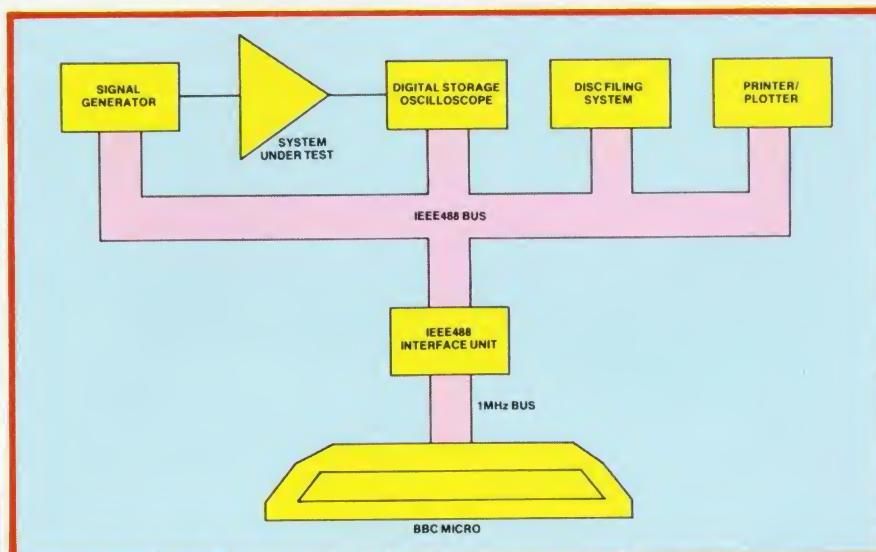


Figure 1. Typical IEEE test rig

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of range, data buffer full or invalid command. It does not affect the current operation on the bus and it is up to the controller to take the necessary action.

**EOI—End Or Identify.** The data transmitting device (which may or may not be the controller) drives this line high, simultaneously transmitting the last byte of data.

The data is transmitted over the bus as strings of ASCII codes. The strings are sent one byte at a time and 'handshaking' is used for each byte, thereby giving very reliable (and fast) transfer of data. Using ASCII encoded data overcomes the problem of different instruments or systems representing numbers and control codes in different ways. ASCII codes use only seven bits out of the eight in each byte and so in some systems the eighth bit is used for parity checking. It is sometimes necessary to send the full eight bits of each byte and this may be done by transferring each byte separately.

The full complement of functions described by the standard is rarely implemented on any one instrument simply because they are not all needed and so subsets are implemented as required. The standard allows for more than one controller to be connected to the bus and provides facilities for transferring control from one to the other. However some systems, such as Pet and Apple, implement a subset that allows only one controller, and in the case of Pet computers the device addresses are fixed as well.

Each device connected to the bus must have a unique address, which may be in the range 0 to 30. This allows a range of instruments to have their device address preset so that any combination of them may be used on the bus without having to change device addresses every time the combination of instruments is changed. The address is usually preset on each instrument by a switch on the back panel. In some instruments it is preset by the manufacturer and may be altered by changing links on the circuit board; in others it is fixed. Occasionally, it may be set as required through the software.

This address is called the primary address of the device. Secondary addresses are those within a particular instrument that allow the controller to select the required function. A digital multimeter, for example, would have several secondary addresses for the selection of DC, AC, voltage, current, resistance etc.

To make an objective assessment of the systems from Acorn, Cambridge Computer and CST-Procyon the relatively simple task of sending a data array from the computer memory to a

printer via the interface was programmed for each of the three units. Data sent was the ASCII encoded listing of the program required to effect the data transfer. Two versions of each program were run, first using data strings and secondly single bytes. The program listings are shown in listings 1 to 6 (yellow pages xi and xii) with comments on those instructions peculiar to each interface. The programs were written at the highest level available, ie, Basic, as this is easiest to read to compare. For high-speed data transfers, lower level routines should be used where provided.

The Acorn unit is externally attractive, being housed in a moulded case that matches the colour and profile of



The Cambridge Computer Consultants (Aries Computers) unit has three useful LEDs



Software for the CST-Procyon interface is in an EPROM

the BBC computer. Connection to the computer is via a ribbon cable terminated with an ID connector for direct connection to the 1MHz bus. The 1MHz bus connector is stackable at the interface end, thus allowing other interfaces or systems access to the 1MHz bus. The unit contains terminating resistors for the 1MHz bus which may be easily unplugged from their sockets if the unit is not the last device to be connected to the computer. The power supply is on the same PCB as the rest of the circuit, except for the mains transformer, and the unit comes with a fitted mains cable with moulded integral 13 amp plug.

The software to run the interface is in an EPROM which plugs into one of the vacant ROM sockets inside the BBC computer. The manual has comprehensive instructions for fitting the EPROM and for making the necessary link changes if your machine is pre OS 1.0 (Acorn says it will provide and fit a 1.2 operating system ROM free if you still have the 0.1 operating system ROM).

The computer treats the interface as a filing system and selects it with the \*IEEE command. Immediately following the first use of \*IEEE you must carry out four instructions. These are: open the command and data channels; set the device address of the computer; and clear the interface. Channels to peripheral devices must be created using the command OPENIN (line 90, listing 1) and set up to LISTEN (line 100) or to TALK before data transfers can take place (line 130). Up to 14 channels can be open at any one time.

If the data is to be transferred byte by byte instead of as a string, the interface must be informed and told the number of bytes to be transmitted (line 110, listing 2). BPUT#<channel>(data byte) is used to output the data rather than the PRINT#<channel>(data string) instruction used otherwise. It is good housekeeping practice to close channels when they are no longer required, as the channels remain open even if a different filing system is selected. Channels are closed using the CLOSE #<channel> instruction or the CLOSE#0 instruction which closes all channels except the command and data channels.

Listings 1 and 2 imply that the Acorn unit requires more programming effort than the other two and this is probably true. However, they also disguise its underlying versatility. It is possible to allow one device to 'talk' to others without involving the computer in data transfer, leaving it free for other tasks. Control may be passed to another controller connected to the bus and requested back again, and the system may be used with any language running on the computer that allows the use of a filing system. The language structure used in the instructions makes it easy for the programmer to keep track of what is going on.

The manual is not for the uninitiated. Its brevity is chilling. However, those familiar with the IEEE interface will probably find most of what they require, the documentation outlining the commands in Basic and the operating system calls that are used by the interface.

Cambridge Computer Consultants' unit comes in a compact metal case with three LEDs on the front panel that indicate the status of the ATN line, whether the interface is addressed to TALK and whether data is being transferred—a useful aid when fault-finding an inoperative system. The back panel has the device socket and six miniature DIL switches, five to set the device address of the interface and one to set the interface as the 'master' controller or the 'slave' controller. Unfortunately, in the Off position the switches actually

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touched the side of the slot in the case and were difficult to move back to On.

Again, the unit's power supply is on the same board, except for the mains transformer. The mains connections to the transformer tags were covered with a piece of insulating tape. Connection to the computer is via a ribbon cable terminated with a non-stackable ID connector for direct connection to the 1MHz bus.

The software is supplied on disc or cassette and consists of a library of procedures and functions in Basic that are loaded into memory above the user program. The library line numbers start at 30000 and the library itself occupies just under 1.8k. A well-documented source program describes the purpose of the functions and procedures.

The CCC unit is used by calling procedures to perform the required tasks. Before any data transfers are attempted, the bus must be initialised by calling PROCIEINIT<address>. The argument for this command is the base address of the memory mapped Input/Output, &FC20. To set the interface up as a TALKer the PROCIEWRIT-<LISTENer device address> instruction is used (line 60, listing 3). The device address used here must contain the device primary address and, if there is one, the secondary address. If there is no secondary address '-1' must be inserted instead. Data can then be sent either as an array, in strings or byte by byte (line 70, listing 3 and line 80, listing 4).

If the data is to be sent to more than one listener, each listener must be enabled separately by calling a procedure PROCIELA<listener address>. This is necessary where device events need to be synchronised.

This unit required four instructions, including the housekeeping, to perform the simple program listing task, which compares favourably with the Acorn interface. But for a more complex IEEE488 link-up with several devices connected to the bus the Acorn unit is preferable, with its greater range of instructions available.

The manual gives a good introduction to the IEEE488 standard and describes in some detail most of, but not all, the procedures and functions in the software. The documentation is, however, inadequate for anything other than simple data transfers. The means of implementing such commands as Local Lockout, Selected Device Clear and a few others is not described at all. Irritatingly, the user is referred to the Texas Instruments data sheet for the TMS 9914 IEEE488 controller chip to find the necessary information.

Details of various options are given

in the manual, as are other technical details of internal modifications, including details of operation under interrupt.

The CST-Procyon unit is housed in a smart anodised aluminium case with the 1MHz bus and IEEE488 bus connectors on the back panel, which also contains the mains socket. The front panel has three LEDs for Data In, Data Out and Bus Active. The unit has an on-board power supply, the mains transformer also being mounted on the board.

The mains connections to the transformer are close to the edge of the board but are not insulated.

The software for this unit is in an EPROM, which fits into one of the



**Christopher Turner, head of Acorn's IEEE Interface team, demonstrates the cosmetically matching Acorn bus unit**

vacant ROM slots on board the computer. The manual gives explicit fitting instructions.

It is obvious from the listings that this unit requires very little programming to output an array of data from memory – just two instructions, in fact. The interface is also treated as a filing system, as was the Acorn interface, and is also called by \*IEEE. Using the command \*IEEE automatically initialises the interface. Opening and closing of data channels is also automatic and is performed in the execution of the PRINT#<channel number> or INPUT#<channel number> instructions. Thus only one instruction is required to output the data to the required channel. If a device has a secondary address, or more than one channel is listening you have to add a further instruction; a channel must be opened (with OPENIN) stating the primary and secondary addresses of all devices required.

The documentation for this unit is excellent and complete, covering not only high-level control of the bus in Basic but also in the lower level star commands, which use the IEEE standard mnemonics, and the BBC's operating system calls. Of the three, the CST-Procyon manual was the only one to specify the maximum data transfer rate, quoted as 50k/sec.

All three units have been manufac-

tured to a high standard and are mechanically robust, giving confidence in their long-term reliability.

For simple system configurations – for example, one talker and one listener – the CCC unit is ideal. It is easy to program at this level, does not involve fitting a ROM inside the computer and is relatively inexpensive. The unit is now marketed by the renamed company (Aries Computers) with the model name Aries-B488 and a number of improvements have been incorporated since the model was received for review.

The DIL switches on the back panel have now been removed and replaced by software programmable latches; the initialisation routine now includes the IEEE device address of the interface; the unit allows direct device-to-device communication and the software includes a simple means of placing numerical data that has been received in string format into arrays in the BBC micro.

The Acorn unit has a very full implementation of the standard and is therefore well suited to systems involving several instruments. Programming for multiple devices is no more difficult than it is for a single device.

The CST-Procyon interface has the fullest implementation of the standard, as it is possible to use this unit either as a controller or as a device and to change between the two functions. In controller mode it may be the overall system controller or a slave controller. In device mode it behaves as a device controlled by the current controller, which enables any machine or computer with an IEEE488 interface to control the BBC micro remotely.

Control via the interface is achieved using secondary addresses to give access to the operating system calls of the BBC. Specifically, these are the IEEE filing system, the OSCLI, OSBYTE, OSWORD, OSWRCH and OSRDCH routines.

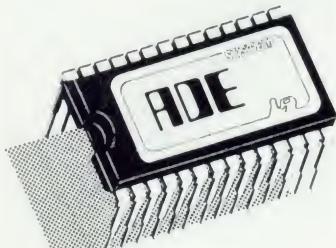
CST-Procyon also offers a CBM filing system ROM to enable the Commodore peripherals to be used with the BBC micro and a set of libraries to support the use of the interface from most of the languages available on the Torch and Acorn Z80 second processors. Also available is an IEEE bus analyser ROM for diagnostic testing of other IEEE hardware.

There is a one-year warranty with guaranteed replacement of a faulty unit by the next working day.

Which one is the best buy? Well, it depends on what application you have in mind, and what facilities you therefore require. It would be fair to say that, with all three units, you get what you pay for.

# SYSTEM SOFTWARE

## •ROMs FOR THE BBC MICROCOMPUTER•



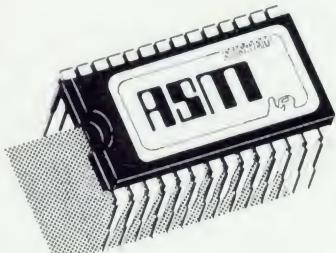
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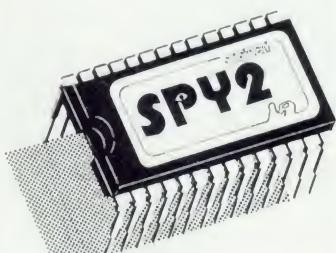
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In all SPY2 has a comprehensive set of 23 utility commands. These are supported by an excellent Reference Manual.

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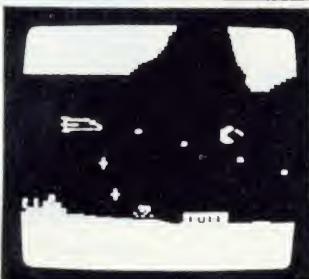


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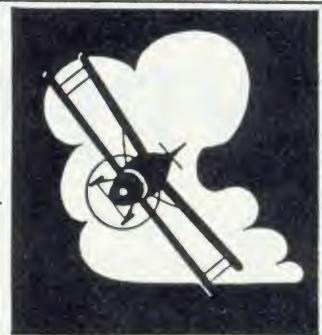
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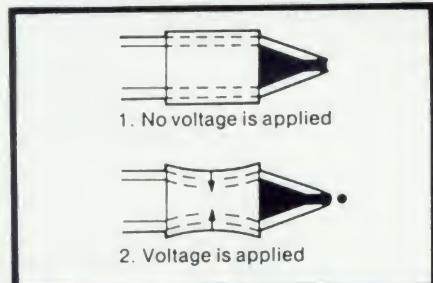
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# PIXELS ON PAPER

## George Hill finds a perfect colour match for the Beeb

**Canon PJ1080A ink-jet colour printer, £433 + VAT (review model supplied by Microperipherals)**

**T**HE CANON PJ1080A, one of a new generation of moderately priced colour printers, works on the ink-jet principle, which means that anything you can do on the screen you can do on the printer—bar charts, pie charts, colour graphs, screen dumps, coloured text. The real joy of the system is that it uses the same numbers to represent the colours as the Beeb does. This makes possible precise screen printing (I will explain how this is accomplished later).



**Figure 1.**

The PJ1080A (not to be confused with the PW1080A dot matrix printer reviewed last month) uses the ink-jet principle in the 'drop on demand' form. That is to say, small drops of ink are expelled at high speed from the print-head by an electrically induced compression (figure 1). The drops are ejected from four nozzles for the four coloured inks, and the compressions timed to cause the required drop to hit the paper at the right instant.

This form of ink-jet technology produces a lower resolution than the other ink-jet method, involving charged droplets of ink in a directing field, the PJ1080A's being approximately equal to that of a conventional dot matrix printer (560 dots per line, non-overlapping).

To understand how the printer can so closely mimic what is displayed on the screen we need to consider the theories behind producing colour images.

Red, green and blue are the primary colours for transmitted light, and they can be mixed in any proportions to make the other colours—yellow, magenta and cyan. This is the basis on which the RGB television system works.

The situation is exactly reversed, however, when you are mixing coloured pigments, because the colours are now reflecting rather than emitting light. The primary colours here are the complementary colours yellow, magenta and cyan, which can be mixed to make red, green and blue. It follows, therefore, that there's a simple mathematical relationship between the two systems for mixing primary colours to create their complementary colours.

Actually, the Canon has four different coloured inks: yellow, magenta, cyan and black. Although black can be achieved by mixing the other three colours, the availability of black avoids the need to overprint three times – which carries the risk of smudging – and allows the printer to be used in normal printing mode. It also makes it possible to switch between black and white backgrounds, even while colour printing.

There are a few minor problems with this technology – the blue comes out rather purple and the other colours are a trifle pale, but the Canon's overall results are startling.

What of the Canon's text? Well, it is barely tolerable. The style is ugly, being based on a  $6 \times 8$  matrix with no descenders. The g is so bad that the manual mis-prints magenta as mazenta to avoid the embarrassment of showing it off in purple. The most peculiar thing is the O, which is really

an upside-down Q. This distinguishes it from the 0 but produces very peculiar-looking text.

The printer can print in bold mode (ie, deeper colours, using two drops of ink instead of one), enlarged mode, and of course in colour. It can print in any colour with any other colour as background and all is under software (ESCape sequence) control. The main features can be preset on easily accessed DIP switches.

Print speed is quoted as 37 characters per second, which boils down to a benchmark (actual printing speed in normal use) of 30.5cps in normal mode and 16.2cps in bold mode if you test it against program 5 (see page xiv). To use the program a stopwatch (not the TIME function on the Beeb) should be set to time the interval between first carriage movement and the appearance of the last character. Speed in characters per second is 2000/time taken.

The biggest disadvantage of the PJ1080A is the paper-handling. This Canon will cope only with friction feed paper of a maximum width of 216mm (8½in), which restricts it to roll paper or A4 sized cut sheets. You can't use fan-fold paper – it's too wide to feed in. Nevertheless, the roll-holding arrangements, as with all the other hardware features, are neat, well thought out and well engineered.

The manual for the PW1080A dot matrix printer was the best I have seen. This one is produced along the same lines, but it is so verbose and repetitious that it is difficult to see the wood for the trees. It is, however, full of programs, all in LPRINT terms.

To summarise its attributes, the PJ1080A colour printer is the greatest thing since sliced bread for graphics, adequate but slow for program listings, but a complete non-starter for word-processing.

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# A: DUMP IT IN ITS TRUE COLOURS

See your way clear to accurate dumps with George Hill's routines



IT IS worth trying to mimic the BBC Micro's screen precisely in your printout, instead of being satisfied with a mere reasonable representation. But how do you produce a dump for a genuine colour printer? To do this we must first understand the organisation of BBC colour graphics.

The colour system on the Beeb is remarkably simple. Three bits represent any of the colours from 0 to 7:

Bit 0 (least significant) represents the RED component

Bit 1 represents the GREEN component

Bit 2 (most significant) represents the BLUE component

In binary terms:-

001 colour 1 is RED

010 2 is GREEN

011 3 is red and green mixed, giving YELLOW

100 4 is BLUE

101 5 is blue and red mixed, giving MAGENTA

110 6 is blue and green mixed, giving CYAN

111 7 is red, green and blue mixed, giving WHITE

Add a fourth bit and any of the above colours can be made to flash. This is done by subtracting them from 7 at a regular interval (using the EOR instruction), so colour 5 flashes with 2, 3 with 4 and so on.

How does the computer manage in modes other than mode 2, where only

two or four colours are available? The answer is by 'mapping'.

Let's look at mode 1 as an example. The GCOL command can have as its second argument the numbers 0, 1, 2 or 3 for foreground colour. These numbers correspond to the colours black, red, yellow and white. Thus the 'logical' colour is 0, 1, 2 or 3, but the 'physical' colour is 0, 1, 3 or 7. This relationship between logical and physical colour is accomplished by using a 'palette'. Thus when a mode 1 GCOL 0, 2 is encountered the micro consults a table (such as table 1 overleaf) to discover that logical colour 2 is actually physical colour 3, and so it plots yellow rather than green.

A copy of this table is located in normal RAM, at addresses &36F to &37E. It can be read by an OSWORD call, and written to by VDU19, etc, or via OSBYTE (\*FX155) or OSWORD.

The use of VDU19 (which writes to the palette) is exhaustively covered in vari-

ous places, including the *User Guide*. Its OSWORD and OSBYTE equivalents offer few advantages and are best avoided by the amateur. The technique by which you can *read* the palette is less well known, but it offers a powerful method of adjusting screen dump programs to read the actual colour physically displayed, as opposed to the logical colour, which is determined by the POINT function and its OSWORD equivalent (called with A% = 9).

The procedure to read the palette is:

1. Read the logical colour using OSWORD with the accumulator set to 9.
2. Use the value found by step 1, and pass it to OSWORD with the accumulator set to 11 (&B). This will read the palette, and puts the physical colour in the next byte, followed by the three trailing zeros used by VDU19 and destined for 'future expansion' – whatever form that may take.

To do it we need to set aside a block of



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```

DIM block 8      :REM reserve 9 bytes
block!0=X_coord :REM insert X
block!2=Y_coord :REM insert Y

A% = 9
X% = block MOD 256
Y% = block DIV 256
CALL &FFF1      :REM OSWORD
A% = 11
X% = (block+5) MOD 256
Y% = (block+5) DIV 256
CALL &FFF1
on exit from the procedure
logical_colour = block?5
physical_colour = block?6

```

Listing 1.

memory. This can be at an absolute address that you are sure is free (eg, &B00, &C00, &80, etc) or a block reserved by a DIM statement. The latter is the preferred method if you want to incorporate the procedure into a Basic program. The length of the block is nine bytes (five bytes for Osword 9, plus four for the physical colour and three trailing zeros).

First set the X and Y registers (or X% and Y%) to point to this block of memory. The X and Y co-ordinates of the point to be read are placed in the first four bytes of the block. Now set A to 9, CALL OSWORD, and the logical colour is deposited in the fifth byte.

Reset the X and Y registers to point to the fifth byte of the block (where the logical colour is), set A to 11 (&B), and CALL OSWORD again. The physical colour is deposited in the sixth byte of the block, followed by three zeros in the seventh to ninth bytes of the block.

The Basic version would look like listing 1.

Translated into assembly language it looks like listing 2.

On exit the logical colour is in block + 5, and the physical in block + 6.

This is much simplified in actual programs by the use of labels, and the internal calculation of Xlo, Xhi and so on, which do not need re-setting on every entry.

This gives rise to two programs. The first (listing 3, page xiii), a hybrid Basic/assembler program, is a 'universal' pattern dump for all graphics modes, using the ESCape L (double-density graphics) sequence available on many Epson, Star, Canon, Shinwa, Inforunner and Panasonic printers (any others?). It dumps the screen 'sideways' with minimum distortion—though it still suffers from the Epson problem of oval circles. It copes with all colours in all modes and is impervious

to VDU19 changes, though it is less than perfect in mode 0 if VDU19 has been used. How it works should be obvious to those who followed the article in the December issue on the universal dump. It is shorter and faster than the December dump (although I don't like the patterns so much) and it overcomes the problems of that dump in normal mode 0 use. Use program 3 as follows.

1. Find the place in the program where you want the dump to occur.
2. If using tape, suppress messages by inserting the line \*OPT1,0.
3. Insert the line VDU7:CHAIN"C/EPAT" (VDU7 gives a signal to start the tape—messages have been suppressed!).
4. Run the resulting program.

Listing 4 (pages xiv-xv) deals with the Canon colour graphics system, which is not unlike that of the Olivetti Spark-Jet printer. It requires colour information to be sent in single horizontal lines. You define the number of dots per line that the printer is to expect, using ESCape "X" n, where n is the number of bytes of dots (ie, number of dots/8). You then send three times that number of bytes—one set for RED information, one for GREEN and one for BLUE. There's also an alternative system which repeats each line a specified number of times. This is ESCape "r" n1 n2, where n2 is the same as n in the ESC "X" sequence.

I decided to use the latter technique, and to step the X co-ordinate by 2, thus reading mode 0 pixels once, modes 1 and 4 pixels twice, and mode 4 pixels four times. This combines with the two-dot-line depth per pixel to give a completely distortion-free picture filling the paper. (The meaning of n1 is one of the serious errors in the manual, which states that the line of dots will be printed n1 times, whereas it is actually

```

.point lda #9          \read logical colour
        ldx #block MOD 256
        ldy #block DIV 256
        lda Xlo           \low byte of X_coord
        sta block
        lda Xhi           \high byte of X_coord
        sta block+1
        lda Ylo
        sta block+2
        lda Yhi
        sta block+3
        jsr &FFF1
        lda #11           \read palette
        ldx #(block+5) MOD 256
        ldy #(block+5) DIV 256
        jsr &FFF1
        rts

```

Listing 2.

repeated n1 times—ie, printed n1+1 times.)

The dump calculates the physical colour for a point, as described above. On the first pass the least significant bit (LSB), corresponding to the RED information, is rotated into the printer byte, on the second pass the LSB is dumped and bit 1 (GREEN information) is rotated in, and on the third pass the BLUE bit (2) is rotated in. The process is carried out 8 times for each byte, and then that byte is sent to the printer via OSWRCH (equivalent of VDU1,byte).

I have departed from my usual style of short, comprehensible sub-routines for this dump, as there are clear advantages in having the code fit into a single page of memory (ie, within 256 bytes). Furthermore the calling of sub-routines—even in assembly language using jsr—is relatively slow, and this printer is not the most rapid, and so it needs all the help we can give it.

The program is written so that it auto-saves the machine code under the name CANONPJ, which can thereafter be \*RUN (from tape) or run via \*CANONPJ from disc. It saves in the unused cassette buffer if you are using disc, and in page 13 (&D00) if you are using tape. These can be adjusted simply at your own need.

The dump includes a jump instruction at its start. It may be re-operated after initial \*LOADing or \*RUNning by the statement CALL&A00 (disc version) or CALL&D00 (tape version).

#### Mode 1

logical colour	physical colour
0	0
1	1
2	3
3	7

Table 1.

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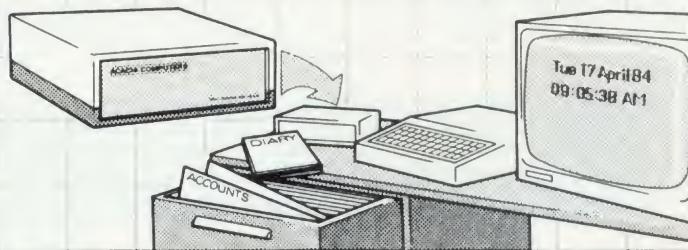
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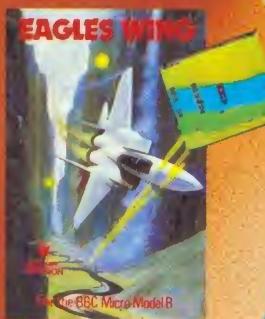
...the movement of the saloon-bar door was all the warning he needed! At the speed of light his hand moved toward his holster, while a sixth sense warned him of the upper floor window... 3D ACTION, SOUND EFFECTS, BEAUTIFUL GRAPHICS BBC MODEL B £7.95 CASSETTE £11.95 DISK

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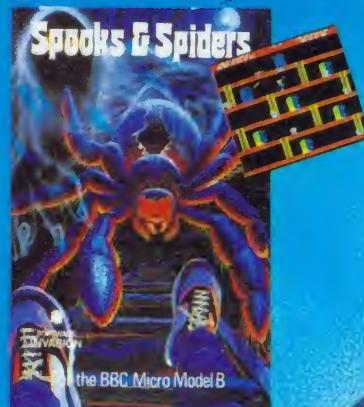
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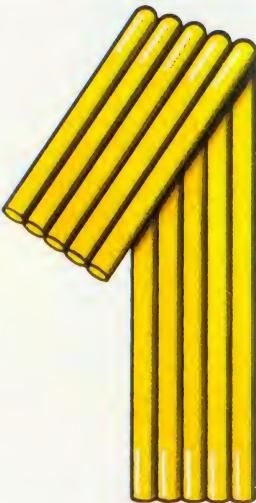


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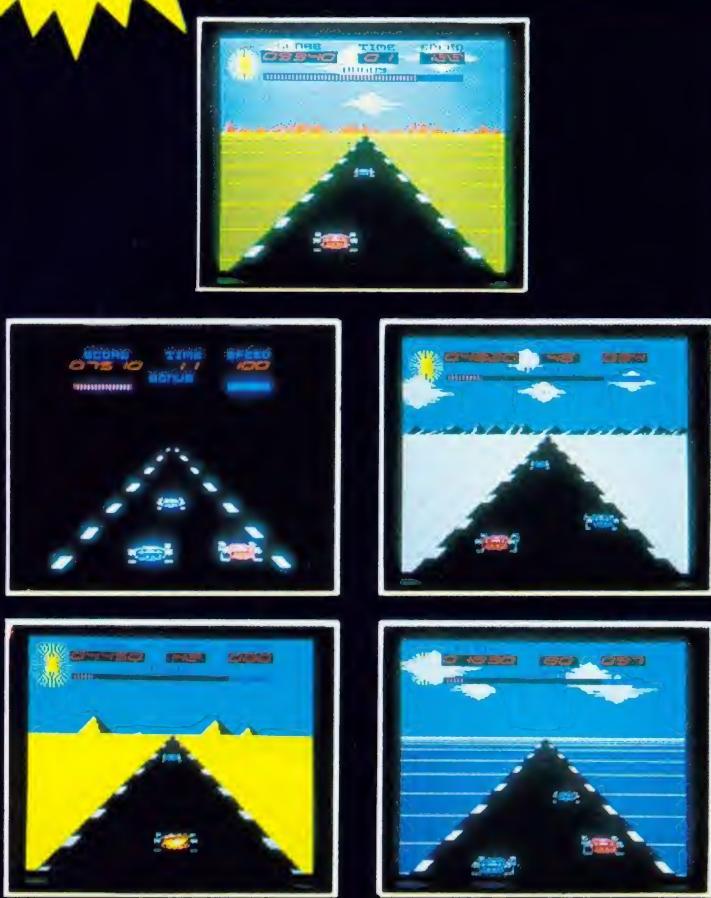
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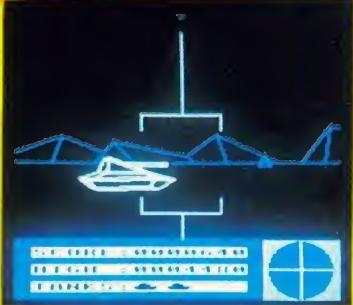
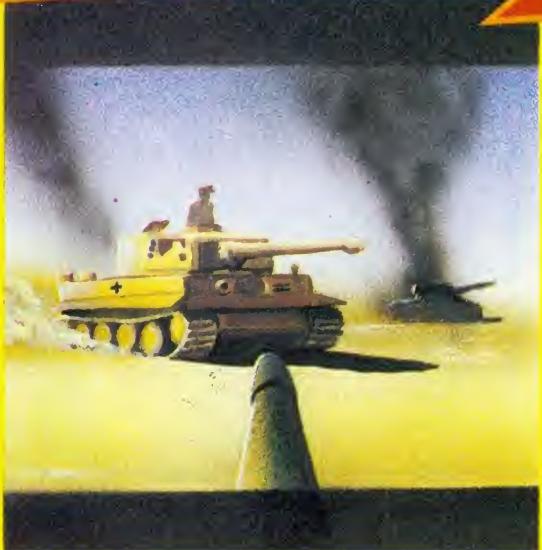
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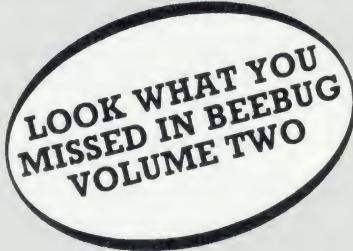
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High recommendation indeed from Personal Computer News. Meanwhile Acorn User said:

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An advertisement featuring a large black banner at the top with the text 'THE MICRO PULSE 3INCH 100K DISK DRIVE + MIRROR' in white. Below the banner, there's a photograph showing a stack of three 3-inch disk drives and a single drive unit. A prominent price tag graphic in the center-right displays 'Single Disc Drive £149.95 + VAT' inside a black cross shape.

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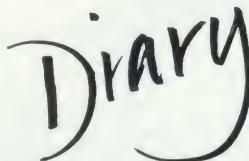
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ACORN USER ADVERTISEMENT PAGES – JULY ISSUE

AB Designs	128	Discotek	105	Midwich	80
Acacia	169	Dobsoft	140	Mirrorsoft	150
Acorn Soft	20/21	Educational Electronics	110	Molimerx	146
Acorn User Show	6	Elbug	136		
Advent	170	Electronequip	24/25	Northern Computers	182
AJ Vision	170	EMS (Programming)	120		
Akhter	116	Epic	106	Opus	76/124/151/180
Alphadisk	59				
Ampalsoft	30	Flightdeck	17	Pace	52
Applied Real Time Systems	128	GCC (Cambridge)	68	Printerland	104
Beebug	175/176	Gemini	64	Proxima	154
Beebugsoft	40/41	Golem	106	Redhatch	134
Bel Tech	62	Graphitek Electronics Ltd	23	Robot	117
Benwick Electronics	120	Guardian Software	112		
Birdseye Walls	8	Harris McCutcheon	98	Salamander	88
Bits & Bytes	130	Harvard Apparatus	117	Screens	140
British Telecom	148	Ikon	156	Shard Software	114
Broadway Electronics	158	Inmac	11	Silent Computers	134
		Intech	100	Simonsoft	17
Cambridge Computer Consultants	144	Intelligent Interfaces	70/71	SIR Computers	162/169
Cambridge Computer Store	168	Interface	130	Skywave	151
Cambridge Micro-Processor	120	Interface Components	64	Slogger Software	162
Chase Data	96/97	Intersoft	134	Software Invasion	171
Cheetah Marketing	122	Kansas	42	Solidisk	118/119
CJE Micros	72	Kosmos	140	Spider Systems	102
Clares	74			Superior Software	43/91/174/IBC
Computer Concepts	16/82/164	Learnwell	23	Synergy Software	152
Computer Room	134	Level 9	138	System	160
Computer Town	84/85	Lion House Micros	55/56/57/58	T-Soft	104
Computerama	66	LVL	IFC	Tec Media	78
Comtec	104			Technomatic	12/13/14
Control Universal	90	Mayfair Micros	132	Three D Computers	175
Croydon Computer Centre	169	Merlin	26	Three SL	168
Cumana	92/93	Micheals Business Systems	23	Torch	172/173
CYB Design	168	Micro-Fast	39	Tutorial Software	112
		Micro-Fix	106	Victor-Morris	170
Data Base	35/166	Micro-Man	17	Viglen	127/129/131/132/133
Datapen	154	Micro-Peripherals	19	Vine Micros	64
Datastore	168	Micro-Resources	98	Vision	22
Datatechnology	4/5	Micro-Test	1	Voltmace	78
Datatrack Technology	135	Microaid	107		
Dataware	112	Micropower	36/37/73/OBC	Walton Associates	179
Diamondsoft	68	Microstyle	142/143	Warm Boot Ltd	179
Digital Peripherals Ltd	90	Microtek Computer Services	179	Watford	44/45/46/47/48/49/50
		Microware	89	West Coast Personal	179
				Sorting Program Courtesy of Gemini	



# ACORN ABUSER'S



184

## Unmasked: magman they couldn't gag

CURIOSER and curioser. Derek Meakin, the 'head of National Micro Centres', as he is proclaimed from his own press release, has spoken out against Mastertronic for slashing the price of its games software to £1.99.

Funny, says we, haven't we heard the name Derek Meakin somewhere else? And his address in St Petersgate, Manchester: isn't that also familiar? Ah, yes, that's the address of Optima Software. That must be why it's familiar.

But what about the phone number given for information, 061-456 8383? Try ringing that and you get Database Publications! Could it be that some user magazines are not as independent as they claim?

## Torch in opposition

SSSH! Don't tell the Tories... but Labour leader Neil Kinnock has gone and got himself a Torch.

Trouble is we can't throw much more light on this particular Torch because they are all so *frightfully* busy round at the Leader of the Opposition's offices.

The chap in charge of the machine is one Charles Clarke, but when tackled about the Torch he was in far too much of a flap to talk about it.

Asked what they were going to use it for, all Mr Clarke had time to gasp was: 'Awfully busy right now. Can you call later... in about a month's

time!' Some comedian.

However, the Curse of the Acorn Abuser struck the next day: a wordprocessed press release from the office went out with the last paragraph missing!

### Bad call

JEREMY Ruston, who's having legal wrangles with Acorn over his latest book which pulls apart the Basic ROM, recently discovered just how good Acorn's communications are. A surprise telephone call from a programmer at Acorn's American operation who was trying to write a spreadsheet interrupted his scribing. It turned out that the only source of advice on the Basic ROM the American could find was - you guessed it - Jeremy. Having a book banned isn't the end of the world after all.

### Quite Likely

AS PART of its rapid growth programme which has already taken in Torch and Torus, Acorn is soon to announce the takeover of an even larger and more established Cambridge-based company.

Dr Alex Reid, director of company purchasing, commented: 'I cannot yet reveal who it is, but we have sent off

the cheque and we have been promised 28-day delivery with a free gift if they are late.'

### Pomographics

A NEW company is being set up to publish the growing range of black market pornographic programs. Acornhard will only sell through high street 'adult' stores and selected bent dealers.

### Wildcards

SECURITY-minded bobs at Cherry Hinton have installed a cardkey doorlock system for Acorn's new high-tech R&D building.

Mastermind of the operation was Andrew Mackintosh, formerly head of Lisa development at Apple and now Acorn's head of advanced R&D.

Claimed Andrew: 'The idea of the system is not to stop journalists creeping in at the dead of night to see our top-secret 68032 second processors. It was installed to prevent some of our hairy hardware engineers getting out.'

### Bitter blow

ANONYMOUS letter from Acorn's Cherry Hinton HQ concerning June's issue to our Ed:

**SCUFFER: Don't you but me!**



## Coming clean...

REMEMBER 'Yossa' and 'Bones' - the two clean programs on the naughty Sicsoft disc which was mentioned last month? Well, someone has owned up to them. It's MRM Software up in Grimsby with a skeleton in the cupboard and, by an amazing coincidence, their ad was facing the Diary page on which we revealed the existence of the blue disc. However, a high-ranking spokesman for MRM denied that they'd written the other programs.

Dear Tony Quinn,  
*What's with the Freudian slips!! ZX80 indeed! You won't live that one down in a hurry.  
Serves you right!*

*Yours in a huff.*

Only comment from Ed: 'What a load of wind.'

### Quote quota

ACORN has hit out at magazines that publish anonymous comments as official policy. In a sharply worded statement a spokesman said 'The magazines are killing the goose that lays the silver lining.'

He also claimed that rumours of marketing man Tom Hummingbird's replacement by a third generation android were 'utterly groundless. I'm as fifth generation as Tony Quill. Oops! Don't quote me on that.'

Qwerty is three months old and still having his cliche procedures debugged.

### Spy network

ACORN has won the Queen's Award for Industrial Espionage. This follows the demonstration of breaking all A&F's protection systems and having copies of their games on Econet within minutes of the originals arriving.

## JARGON JUNGLE

N FINCH of Chingford thought we might like to see this Buzzword Generator (right), which he came across on a computer course. 'It is used to demonstrate how jargon can look impressive but not actually mean anything,' he says. This piece, which earns Mr Finch a fiver, took minutes to compose.

The integrated management capability leads the way for a systematic and responsive supervisory contingency with a view to increasing the inter-active transitional software design. This in turn will have a parallel in the compatibility of third-generation real-time programming.'

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3 total	monitored	flexibility
4 parallel	reciprocal	capability
5 balanced	policy	contingency
6 compatible	third-generation	projection
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8 optional	transitional	time phase
9 responsive	logic	concept
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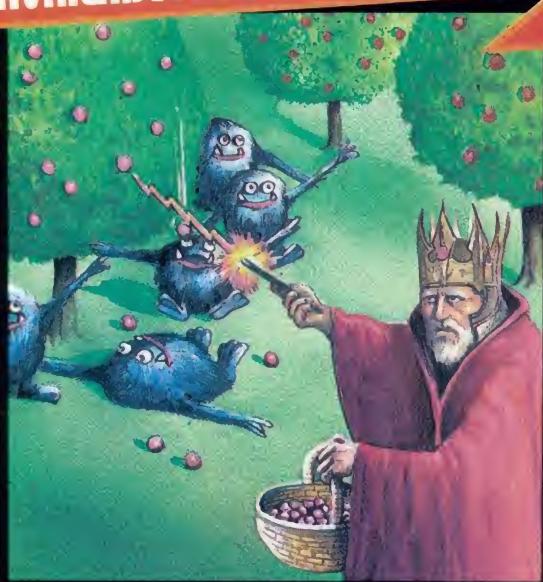


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